MANORAMA

TELL ME WHY

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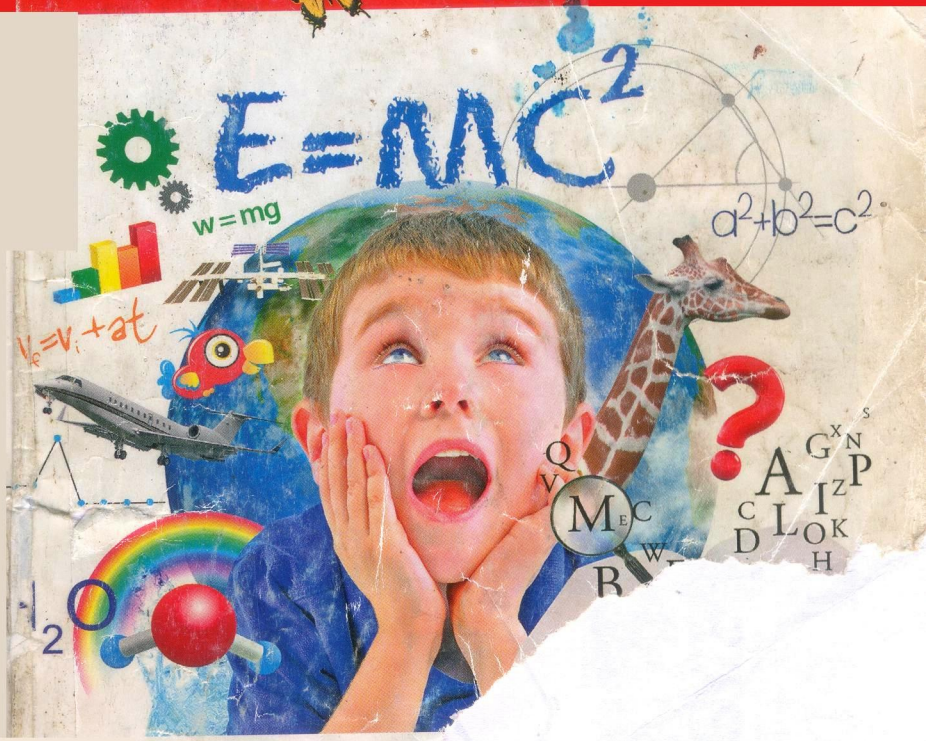

THE CURIOUS
SCIE

MANORAMA
TELL ME WHY

December 2013 • Volume: 7 • No: 12

FROM THE HOUSE OF MAGIC POT, THE WEEK, MANORAMA YEARBOOK, VANITHA & THE MALAYALA MANORAMA DAILY

What a Curious World!

Why does a kite fly?
Why do we cry?
Why doesn't your stomach digest itself?
Why don't ants get hurt when they fall?
Why are there only ten numbers with single digits?

The question ***WHY***? is the corner stone upon which the huge mansion of science stands. It is curiosity that stimulates the growth of scientific knowledge, inventions, and advances.

This issue of Tell Me Why presents a slew of fascinating questions that will capture your imagination as their interesting answers reveal underlying scientific facts.

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THE NATURAL WORLD

Universe in a Nutshell

The Universe became the size of a pea one million, million, million, million, millionth of a second after the Big Bang, and kept on growing!

Why are flowers brightly coloured?

Have you noticed how some flowers are brightly coloured, while others are not? The reason is that bright colours attract the insects that pollinate flowers. Pollination is the process by which pollen from the male part of a plant is transferred to the egg in the female part of the plant, to form a seed. The seed has everything that is needed to form a new plant, so, pollination is very important for a plant species to survive.

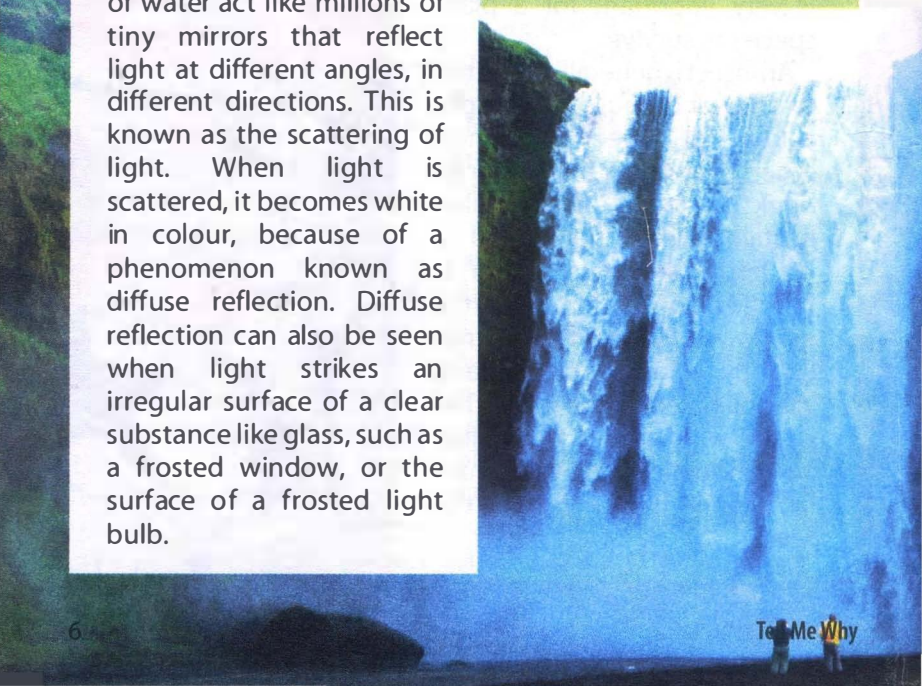
An insect is generally attracted to a flower because of its bright colour, or sweet fragrance. When it lands on the flower to drink the sugary liquid called nectar, pollen is transferred to its body, and this pollen is rubbed off on the female part of the flower. Flowers that are not brightly coloured or fragrant, are pollinated by the wind- that is, the wind carries the pollen from the male part to the female part of the flower to form the seed.

Why do waterfalls appear white in colour?

We know that water is colourless. But once it starts falling from a height, as in a waterfall, it appears white. Why does this happen? The reason is because water has oxygen dissolved in it, and when it falls from a height, the dissolved oxygen evaporates in the form of a gas. Consequently, millions of small water bubbles are formed. These little droplets of water act like millions of tiny mirrors that reflect light at different angles, in different directions. This is known as the scattering of light. When light is scattered, it becomes white in colour, because of a phenomenon known as diffuse reflection. Diffuse reflection can also be seen when light strikes an irregular surface of a clear substance like glass, such as a frosted window, or the surface of a frosted light bulb.

Do insects sneeze?

Insects breathe through tiny holes in their skin. Their breathing system is quite different from that of human beings. Sneezing, coughing, and hiccupping are actions performed only by animals that have a breathing system similar to ours. Dogs sneeze, so do pandas, cats, and even birds - but not insects!



Why do we say that plants have feelings?

Plants may not be able to think, but they can feel. They react to light and gravity, and researchers have discovered that even primitive green algae can sense changes in light direction and intensity. If you keep a plant indoors, you will notice that it will always grow towards a source of light. Plants also respond to touch and sound. The leaves of some plants will droop or shut when they are touched, and it has been observed that plants grow better and faster if one talks to them, or if music is played for them. The great Indian scientist, Dr. Jagadish Chandra Bose invented an instrument that he used to prove that plants have feelings too. However, there is still a lot of confusion as to whether plants can actually feel pain like animals do, or have emotions like you and me.

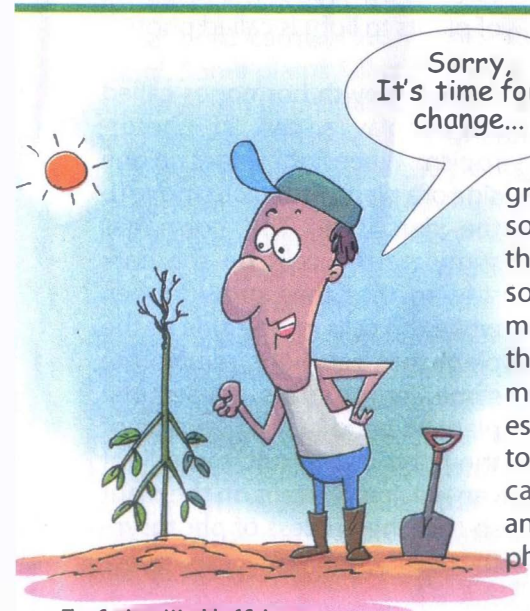
Why are plants green?

Plants are green because they contain a substance called chlorophyll that is green in colour. Chlorophyll is found in the part of the plant that is called the chloroplast. It is a compound that absorbs sunlight. Chlorophyll uses the energy from the Sun to manufacture food for the plant, using the nutrients from the soil, water, and carbon dioxide. This process is known as photo-synthesis – and photosynthesis

Why do stems grow up and roots grow down?

Plants can sense which direction is up, and which direction is down. This is because of a phenomenon called geotropism that helps a plant to respond to gravity. Geotropism is controlled by certain plant hormones. When a seed starts to germinate, no matter which way it is positioned, the roots will always go down, and the stem will always go up. The roots need to

is possible only if chlorophyll is present. Without the green coloured chlorophyll, a plant cannot manufacture its own food, and would die. There are actually other colours found in a plant too, but they cannot be seen, because chlorophyll is a strong absorber of light. Light is made up of many colours in different wavelengths, and chlorophyll absorbs all the other wavelengths except green, making the plant appear green to us.

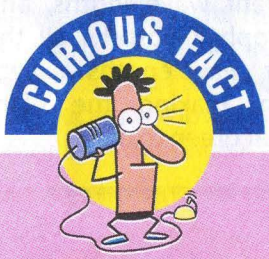


grow downwards into the soil to obtain the water and the nutrients present in the soil. In same way, the stem must grow upwards towards the light, because the leaves must get sunlight. Sunlight is essential for photosynthesis to take place- and the plant can manufacture its food, and grow, only through photosynthesis.

Why do plants grow towards the light?

Plants can sense the direction from which light comes, and will always grow in that direction. If you take a tray of young plants that have been grown in the open, and place them indoors near a window, all the plants will soon bend towards the light. This is because light is essential for the process of photosynthesis through which a plant manufactures its own food. The response of plants to light is called phototropism.

Plant growth hormones called auxins play a part in phototropism. When light shines on one side of a plant, the auxins move to the dark side. The hormones stimulate the cells on the dark side so that they grow longer, while the cells on the side of the plant that gets light, remain the same length. This causes the plant to bend in the direction of the light. As a result, more light can reach more cells on the plant so that the process of photosynthesis can continue.



Never Landing Rains

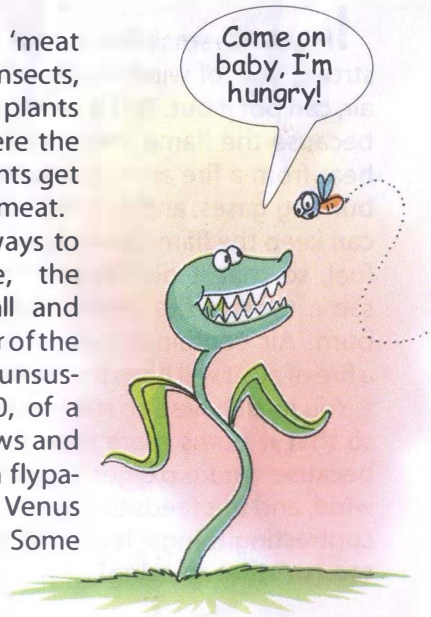
Sometimes, when drops of rain fall on very hot dry air, they evaporate, and turn into water vapour even before reaching the ground. So the ground remains dry, though it is supposed to be raining.

What do we know about carnivorous plants?

The word carnivorous means 'meat eating'. Some plants kill and eat insects, and other small animals. These plants are usually found in regions where the soil is poor in minerals, so the plants get the nutrients they need by eating meat.

Carnivorous plants use tricky ways to get their meal. For example, the bladderwort that looks so small and delicate, is the fastest-known killer of the plant kingdom. It is able to suck in unsuspecting mosquito larvae in 1/50, of a second using a trap door. Sundews and butterworts catch their prey with flypaper-like stickiness, while the Venus flytrap snaps shut on its victims. Some pitcher plants trap frogs!

Venus Flytrap



Natural Freezer

Antarctica, the coldest place on Earth, sometimes has temperatures as low as –89 degrees Celsius. So, living in Antarctica would mean surviving in a place that is much colder than even a freezer.

Why can the wind extinguish small fires and fan large ones?

If there is a small fire, a strong gust of wind, or air, can put it out. This is because the flame and heat from a fire are the result of burning gases, and a blast of air can keep the flame away from the fuel, so that it dies down. At the same time, a fire needs oxygen to burn. Air contains oxygen, so if you deprive a fire of air, it will be extinguished.

You must have also seen how wind can fan a fire so that it burns more fiercely and faster. This is because more oxygen is being supplied by the wind, and this feeds the flames. So, air can do two contrasting things- it can kill a flame, and feed it too. Isn't that amazing?

Inside View of an Aircraft

Why do our ears pop when we are in a plane?

The air high above the surface of Earth is less dense than air near the surface, and as a result, its pressure is much lower than at the surface. So, the cabins of airplanes are pressurized to prevent the pilot and passengers from passing out, because of lack of air. The pressure of air in the cabin is usually less than that of the air on the surface, but more than outside air at high altitudes.

As a plane rises, the air pressure decreases, and the air trapped in your inner ear will cause your eardrums to push outward, causing some discomfort. Your body equalizes the pressure between your inner ear and the atmosphere by allowing some air from your inner ear to escape through two small channels called the Eustachian tubes, that connect the inner ears to the throat, one on each side. As the pressure is released, you will hear a 'popping' sound.

Why can we hear the sound of the ocean when we hold a dry seashell to our ear?

If you hold a large seashell like a conch shell to your ear, you will hear a sound like that of the ocean roaring. Have you wondered whether it really is the ocean? Actually, it is not. Seashells- especially large ones- have many hard, curved surfaces that are good reflectors of sound. As a result, sound waves that are trapped inside a dry sea shell are reflected and re-reflected, creating a jumble of echoes. These echoes create a roaring sound, very similar to the roar of the ocean.

Why are desert floods awesome?

You do not usually associate deserts with rain- but it does rain in deserts. When this happens, the desert sand does not soak up water quickly, and flash floods occur. The rain usually pelts down in bucket loads, and the runoff from the torrential rains cascades into the steep canyons in a matter of minutes. Walls of water swirl through the canyons, picking up mud, trees, and other debris. Plants and animals are caught, and swept along the onrushing torrent that takes place without any warning. More people have been killed by floods in the desert than by thirst!

Biggest Hailstones

Hailstones are lumps of ice that fall from thunderclouds during a storm. In 1986, a hailstone the size of a grapefruit fell in Bangladesh. It is believed to be the biggest hailstone that has been recorded.

Incredible Body

Your skin has more organisms living on it than there are people living on Earth. In fact, the human body itself is like a planet!

Why can a kite fly?

To understand what makes a kite fly, you must first understand the importance of two scientific principles- gravity and lift. Gravity is the force that pulls objects towards the Earth. So, practically speaking, why is it that gravity does not pull down a kite that you are flying?

The answer lies in the second scientific phenomenon- lift. Lift is what happens when the wind pushes against an object, and lifts it up. Lift also depends on the surface area of an object. A greater surface area allows for more lift.

When you run with your kite on a string, it is the wind that provides the lift that makes your kite fly. As long as the force of the wind is stronger than the force of gravity, your kite will keep on flying, but when the wind drops, your kite will surely come back to the Earth!

Why does water ripple when a rock is thrown into it?

When you throw a stone or rock into water, you will notice that it creates ripples. When the rock hits the water, it moves downwards with a lot of energy, and some of this energy moves outward from the centre. At the same time, the surface of the water is pushed down a bit, but since the surface of the water has elastic quality, it comes back up and moves outward, creating the ripples that we see. These ripples are always in a circular pattern, whatever the shape of the stone or rock may be. These ripples will continue as long as the centre continues to 'bounce.' When the water's equilibriumisrestored, the surface is still again, until the next rock, stone or pebble is thrown.

THE ANIMAL WORLD

Which fish uses electricity for hunting?

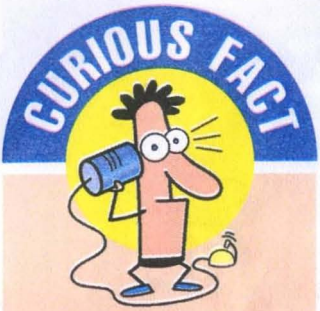
Some varieties of fish use electricity to kill, or stun their prey. The electric currents produced by these fish are generated in cells called electrocytes. When an electrocyte is stimulated, a movement of ions- which are electrically charged atoms- across the cell membrane results in an electric discharge. The electric catfish, for example, can produce an electric shock of 300 to 350 volts to stun or paralyze its prey or attackers. It hunts mainly at night, and is found in the Nile River, as well as Western and Central Africa. Electric rays are found in tropical and temperate waters worldwide. They have two special kidney-shaped organs that generate, and store electricity like a battery. The electric eel is another example of a fish that hunts using electricity. It can generate a shock of 600 volts, which is strong enough to knock down a horse!

Which are the fish that use electricity to see?

Some species of fish that live in the murky waters of tropical rivers use electricity to see. They do this by sending out electrical pulses, and navigate their way through the dark waters by detecting how the pulses are altered. The African Knife fish and Nile fish send out a stream of electric pulses and any obstacle in its path- including other fish- alters the pattern of the pulses. This change is detected by special sense organs in the fish's head, allowing it to 'see' accurately, even in darkness, in spite of the fact that its eyesight is very poorly developed.

World of Neutrinos

A neutrino is one of the fundamental building blocks of the Universe. It is so small that it wasn't even discovered until 1956!



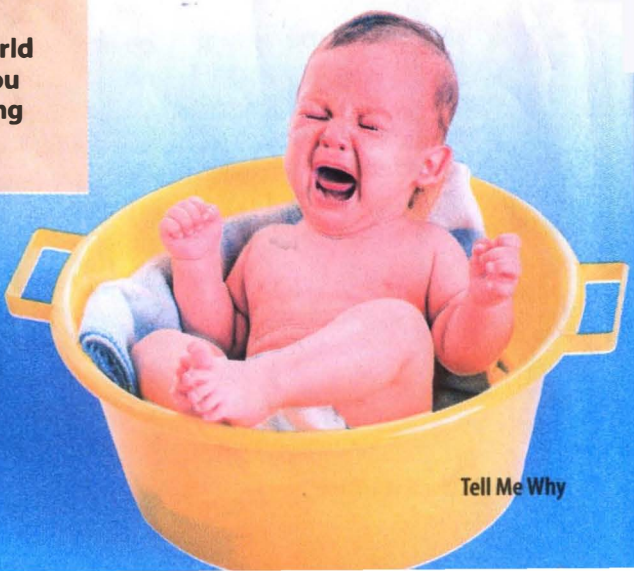
Around the World in 0.13 seconds!

A vehicle travelling at the speed of light can travel around the Earth in 0.13 seconds. That means that if you were in such a vehicle, you would have travelled around the world even before you finished reading this sentence!

Why do we cry?

All of us cry when we feel sad or are hurt. But have you ever thought of how the tears actually come? The fact is, our tear glands are constantly producing tears, but they do not overflow. Tears have a very important function- they protect our eyes from infections as they are mildly antiseptic. They do this by constantly bathing our eyes gently, and then draining away through the tear ducts to the tear sacs and the cavity of the nose.

When we are upset or in pain, our tear ducts produce tears faster than they can drain away. So, they flow down our cheeks instead, and when this happens, we cry.



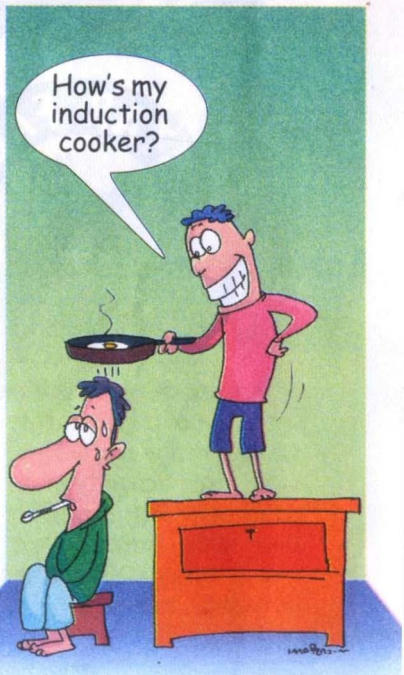
Why do we take our temperature when we feel ill?

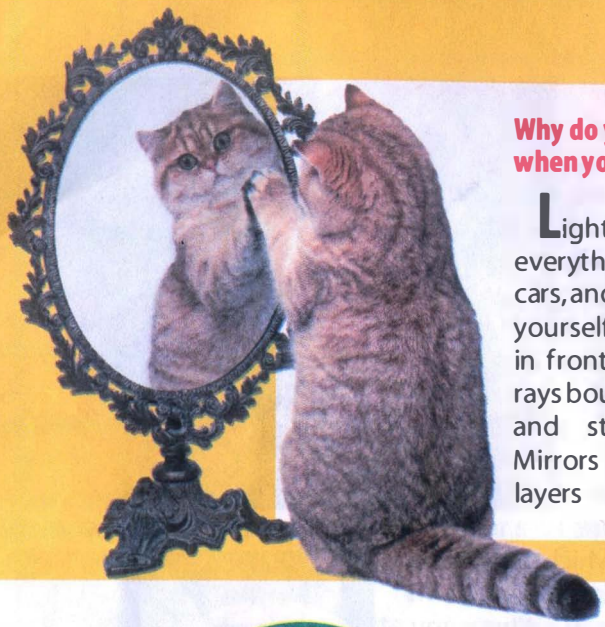
When you fall ill, you feel feverish because your body temperature has risen. Our bodies normally have a temperature of 37 degrees Celsius.

We measure our temperature using a thermometer, which is a glass tube that has a bulb filled with mercury at one end. When you place a thermometer in your mouth or armpit, the mercury in the bulb gets warmed by your body heat, and it expands.

As it expands, it moves up the glass tube that has markings showing your temperature. If your temperature is above the normal level, it means you have a fever. The fever can be caused by some kind of infection- in fact; a fever is the body's way of fighting the infection.

You should see a doctor at once, so that he can prescribe medicines which will help your body fight the infection even more efficiently.





Why do you see your image when you look in a mirror?

Light rays bounce off everything- trees, houses, cars, and people, including yourself. When you stand in front of a mirror, light rays bounce off your body, and strike the mirror. Mirrors are made up of layers of glass. Now

Baby's Teeth

When we think of babies, we think of their toothless smiles. However, some newborns actually enter the world with a tooth or two. It is estimated that one in every 2000 babies is born with a tooth!

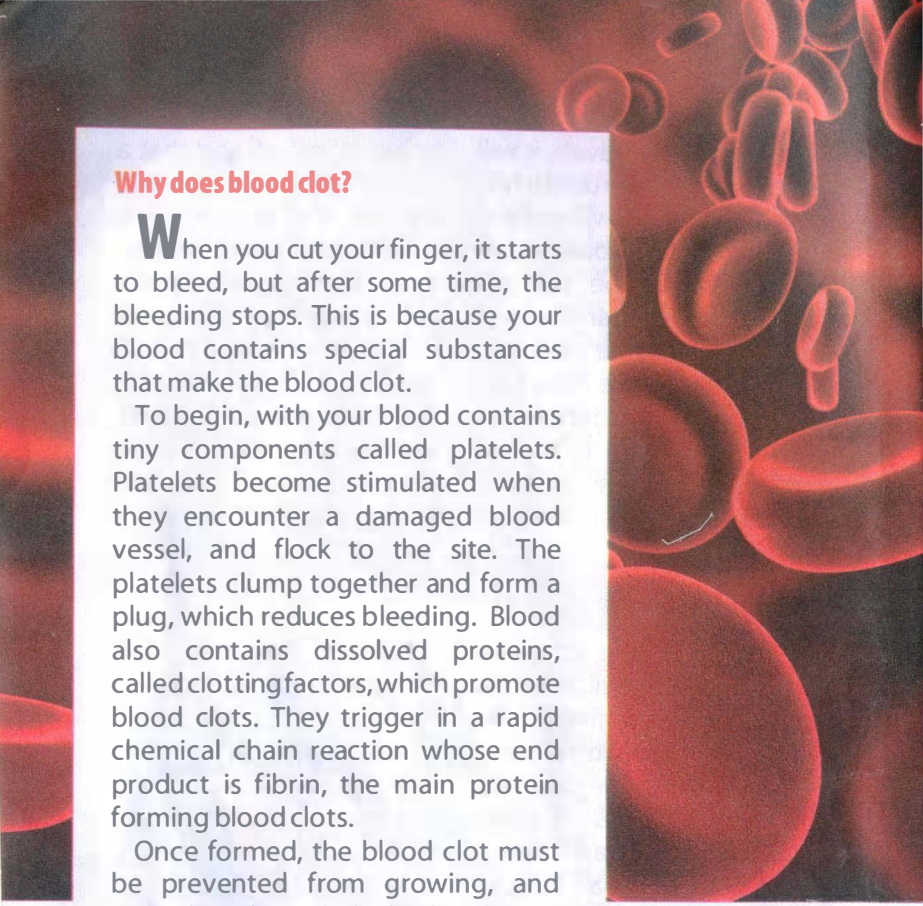
Why does hair go grey?

Have you ever wondered why your grandmother has grey hair? To understand the reason, let us look at a single strand of hair. It is made up of two parts- the root which lies below our scalp, and the shaft - that is the part you see- which grows above the scalp. The root of every strand of hair is surrounded by a bulb shaped structure called the hair follicle. Each hair follicle contains a certain number of pigment cells.

usually, when light travels, it will move in a straight line until it hits something. However, when light hits a mirror, it bounces or reflects, because the mirror's surface is smooth and shiny. These light rays come back and strike your eye. Since light rays are invisible, you cannot see them, so your brain is tricked into thinking that the rays have come directly to you without being reflected, and that a copy of yourself is standing behind the mirror. This copy is your image. However, since a mirror reflects the light rays back in the same direction as in which they have come, your left and right sides in the mirror will be the opposite of what they are when you are facing forward.

These pigment cells continuously produce a chemical called melanin, which gives the growing shaft of hair its colour.

As we get older, the pigment cells in our hair follicles gradually die. When there are fewer pigment cells in a hair follicle, that strand of hair will no longer contain as much melanin, and will lose its colour. It will become gray, silver, or white, as it grows. Most of us will start having gray hair around the same age that our parents or grandparents first did... so you still have plenty of time left before you start getting grey hair!

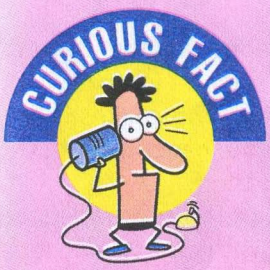


Why does blood clot?

When you cut your finger, it starts to bleed, but after some time, the bleeding stops. This is because your blood contains special substances that make the blood clot.

To begin, with your blood contains tiny components called platelets. Platelets become stimulated when they encounter a damaged blood vessel, and flock to the site. The platelets clump together and form a plug, which reduces bleeding. Blood also contains dissolved proteins, called clotting factors, which promote blood clots. They trigger in a rapid chemical chain reaction whose end product is fibrin, the main protein forming blood clots.

Once formed, the blood clot must be prevented from growing, and spreading through the body, where it could cause damage. Numerous anti-clotting proteins exist in a natural balance with clotting factors. The anti-clotting enzymes prevent the blood clot from extending farther than it should go. Then, as the damaged tissue heals, the body slowly degrades the blood clot, and reabsorbs it.

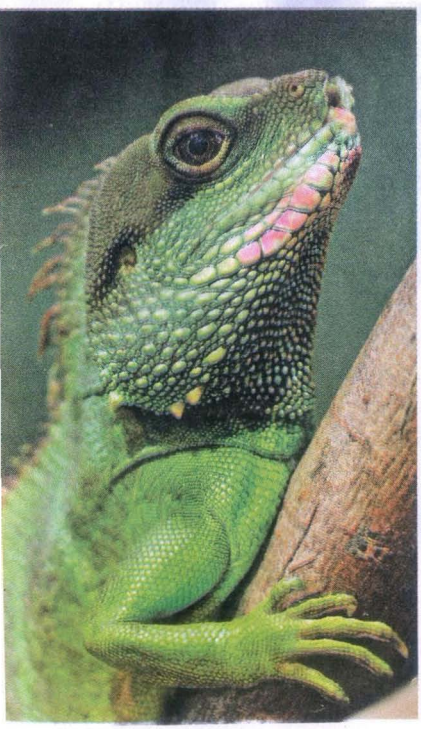


Largest Living Structure

The largest living structure on Earth is the Great Barrier Reef. It extends over 2300 km, along the Australian Coast and covers a huge area of 35 million hectares. Astronauts can actually see it from the Moon! They have described it as a 'fine white line in the blue ocean'.

What determines the colour of your eyes?

All your features- including the colour of your eyes- are determined by special factors called genes that you inherit from your parents. Each of us has two genes that determine each feature. In the case of eye colour, for example, one gene can be for a light brown eye colour, and the other for a dark brown. If the dark brown eye colour gene is more dominant, your eyes will be dark brown. Though the light brown eye colour gene remains hidden, you can pass it on to your children. Sometime in the future, it may become dominant, and your grandchildren, or great grandchildren, may have light brown eyes!



Why does a chameleon change colour?

Chameleons change colour in order to blend in with their surroundings. This makes it more difficult for their enemies – or their prey- to see them.

Chameleons have a transparent outer skin, with several skin layers underneath it that contain special cells called chromatophores. These chromatophores contain sacks of colour pigments that can contract and expand in response to internal signals. For example, if a chameleon became excited, it turns red by causing the red cells to fully expand, blocking out the other colours that are underneath the skin. Once it has calmed down, it becomes green again by allowing the red cells to contract.

Chameleons can expand and contract their colour cells in such a way as to create a whole variety of colours and patterns. Light, temperature, and its emotional state can also bring about a chameleon's change in colour. The chameleon will most often change between green, brown and gray, which coincidently, often match the background colors of their habitat.

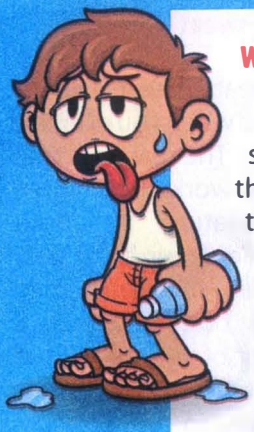
Why do we sweat?

You sweat when it is hot or humid, and when you exercise vigorously. The reason is that your body works best when its temperature is about 98.6°F. When your body gets hotter than that, your brain wants your body to stay cool. So, the part of your brain that controls temperature, sends a message to your body, telling it to sweat.

Sweat is produced by glands in your skin called sweat glands. Sweat is made almost completely of water, with tiny amounts of other chemicals, salts, and sugar. It leaves your skin through tiny holes called pores. When sweat is exposed to air, it evaporates, and as it does, your skin cools down, to bring you relief from the heat.

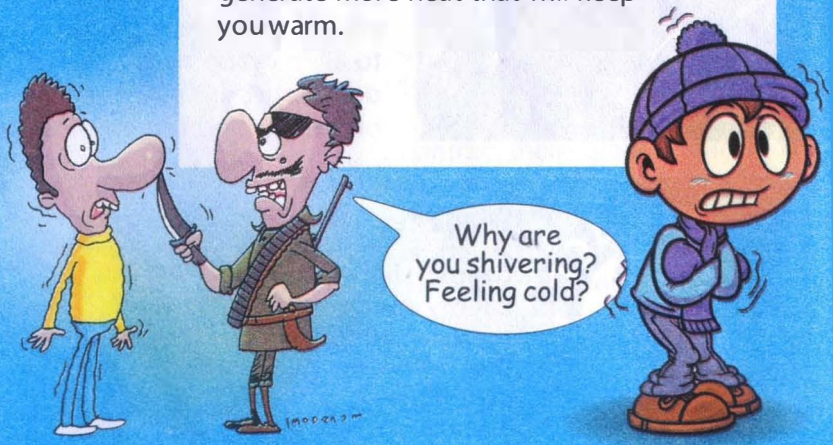
Wind Energy

A typical hurricane produces energy equivalent to 8,000 one megaton bombs. Is it any wonder that hurricanes cause so much destruction?



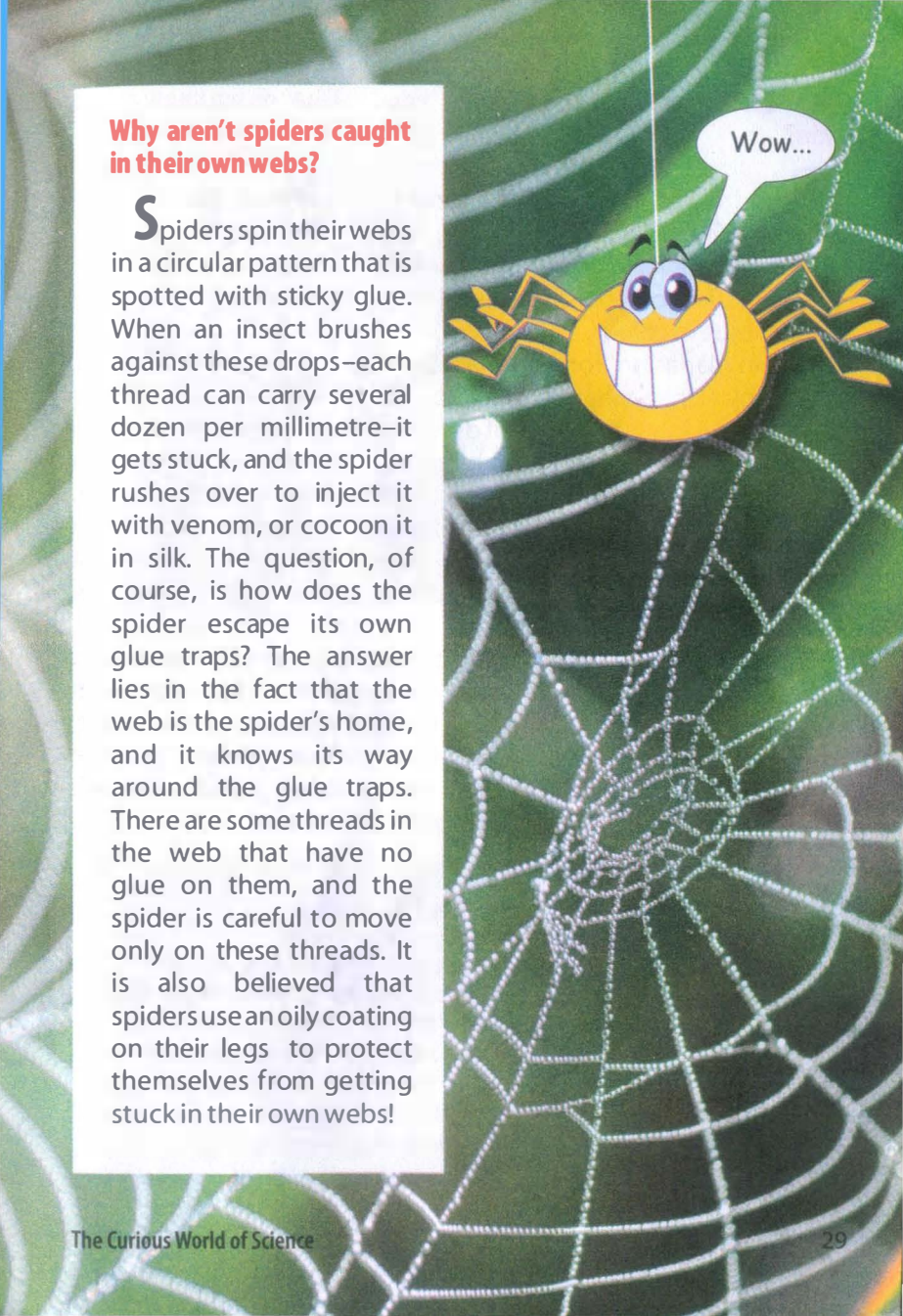
Why do you shiver when you are cold?

Have you ever wondered why you start shivering when you feel cold? Well, the brain is always monitoring your body temperature to keep it at 98.6 degrees Fahrenheit, which is the normal temperature of a healthy person. When your body gets cold, the part of the brain called the hypothalamus tries to raise your body temperature by ordering your muscles to start shaking. This shaking of the muscles is what we call shivering. It generates the heat needed to warm up our bodies. Sometimes, shivering alone does not produce enough heat to keep you warm. It is a good idea then to jump up and down, and flap your arms around. The extra movement will generate more heat that will keep you warm.



Why aren't spiders caught in their own webs?

Spiders spin their webs in a circular pattern that is spotted with sticky glue. When an insect brushes against these drops–each thread can carry several dozen per millimetre–it gets stuck, and the spider rushes over to inject it with venom, or cocoon it in silk. The question, of course, is how does the spider escape its own glue traps? The answer lies in the fact that the web is the spider's home, and it knows its way around the glue traps. There are some threads in the web that have no glue on them, and the spider is careful to move only on these threads. It is also believed that spiders use an oily coating on their legs to protect themselves from getting stuck in their own webs!



Why does blood look blue under your skin?

Blood is red- blood in the arteries and blood flowing through our veins is dark red. However, when you look at the veins in your hands or legs they appear blue in colour.

The explanation for this has been given by Dr. Lothar Lilge and his colleagues. Light is made up of different colours that have different wavelengths which pierce through our skin with different effectiveness. The veins you see through your skin appear blue because red light goes through the skin much more easily than blue light.

The red light is absorbed by the blood vessels, and the blue is reflected back. As a result, our eyes see the blue light, and not the red light that has been absorbed. This makes us think that blood under the skin is blue in colour.

What do we know about left handed animals?

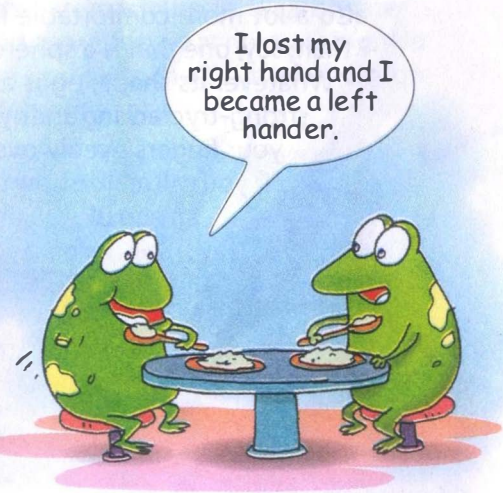
Most people are right handed, though about one in ten among us is left handed.

Animals like chimps, humpback whales, and even toads favour one hand, paw, claw, or fin over the other. Chimpanzees use both hands with ease, but have a preference for the right hand. Toads also prefer their right side to perform different functions. Polar bears on the other hand, are left handed.

Colourless Rainbow

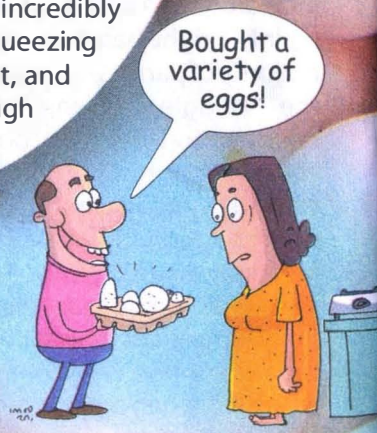
There are some rainbows that are colourless. They are called fogbows, and are formed when the sun shines through a fog. The drops of water in a fog are too small to split up light into its different colours, so the fogbow is white in colour.

Some species of parrot such as the sulphur-crested cockatoo are entirely left-handed, while others, including the king parrot, are mainly right-handed. The majority of parrots - including the budgie, galah, and rainbow lorikeet use both claws comfortably. Female cats are more inclined to be right handed, while male cats favour their left paws. The same is true of dogs. Interestingly, dogs wag their tails to the right when relaxed, and to the left when agitated!



Why are eggs of different shapes?

Eggs come in different shapes. Some eggs, like those of hens and sea birds, are round at one end and pointy at the other- this is called an ovoid shape. Other birds like ostriches lay eggs that are perfectly round, while pigeons lay eggs that are pointy at both ends. The explanation for this difference in shape lies in the number of eggs that birds of different species lay at one time, and the type and place of their nests. Birds that nest on cliffs, such as many seabirds, tend to have eggs that are smaller at one end than at the other. This is to make them roll in a circle, and less likely to fall off the cliff. Birds with round eggs, usually build deep nests that keep them from rolling out. In addition, eggs take on a particular shape so that more of them can be packed together for warmth during incubation. An egg with an ovoid shape is also a lot more comfortable for a bird to lay than, say, one that is a sphere or a cylinder. Whatever its shape, eggs are incredibly strong-try cracking one by squeezing your fingers evenly over it, and you will realize how tough an egg is!



Why doesn't your stomach digest itself?

The stomach produces acids, and other fluids in order to break down the food that we eat into a digestible form. The digestive juices in the stomach consist mainly of hydrochloric acid, which can dissolve even some metals!

The stomach, on the other hand, is made up mostly of protein, and if left unprotected, the acid would eat right through it. Fortunately for us, the stomach walls have a lining of cells that secrete a protective layer of mucus and bicarbonate. The mucus sticks to the walls of the stomach to provide a physical barrier, so the acid doesn't touch the stomach itself. Bicarbonate is highly alkaline and very effective at neutralizing acid. This combination protects the stomach from the danger of digesting itself.

Sun Dogs

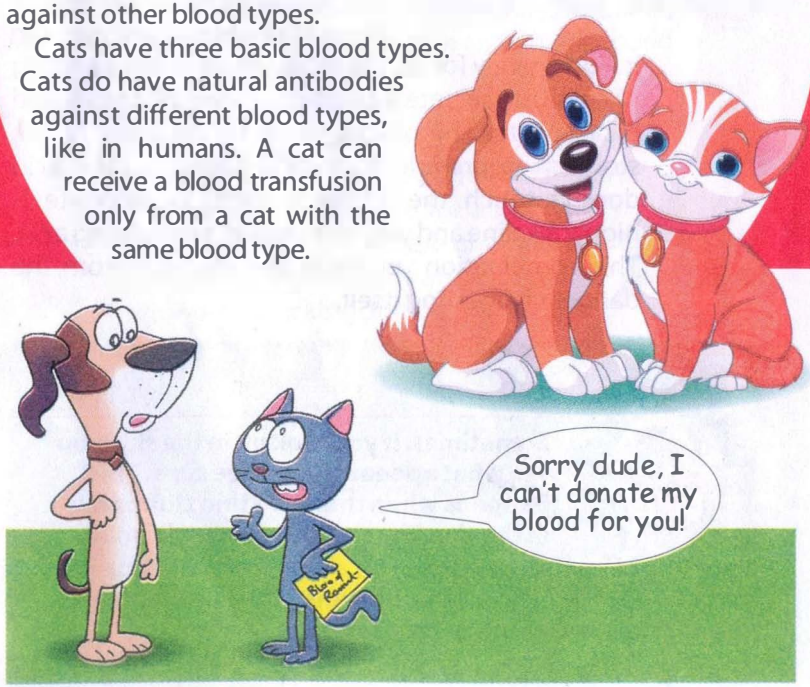
Sometimes, if you look up in the sky, you see what appear to be three suns. This happens when there are thin clouds high in the sky. The clouds are actually made up of bits of ice that bend the Sun's rays so that it appears that there are two more Suns present. The 'false' suns are just an illusion, and are called Sun Dogs.

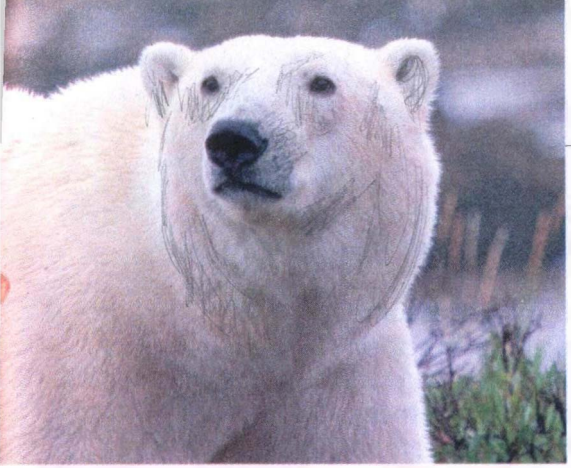
What are the blood groups of dogs and cats?

Humans have mainly four blood groups- A, B, AB, and O. Human blood contains antibodies that will trigger a reaction, if , during a blood donation, the donor is from a blood group that is different from that of the person receiving it. Therefore, before a blood transfusion, we have to 'type' a person's blood, and find out which kind it is.

Dogs have eight basic blood types, though as many as 13 may exist. The types are numbered, and are structured differently than in humans. Dogs do not have naturally occurring antibodies against other blood types.

Cats have three basic blood types. Cats do have natural antibodies against different blood types, like in humans. A cat can receive a blood transfusion only from a cat with the same blood type.





Why are polar bears white?

If you have always admired the snowy white fur of polar bears, you will be surprised to know that their fur isn't white at all!

A polar bear has two coats of hair to keep it warm in the snowy Arctic regions that are its home. The long outer hair that protects the soft, thick undercoat is hollow and transparent, and the thinner hairs of the undercoat are also colourless.

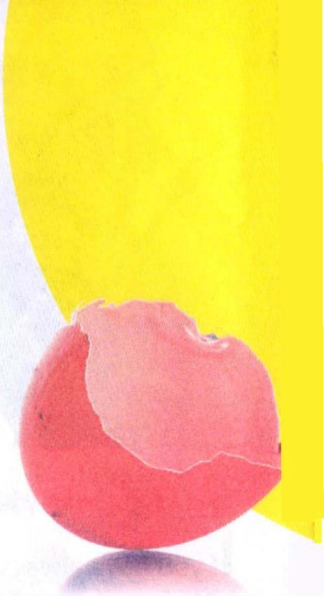
Each hair shaft is pigment-free and transparent, with a hollow core that scatters and reflects visible light- much like what happens with ice and snow. When visible light is scattered, it appears white.

Polar bears look whitest when they are clean, and in sunlight. Did you know that in zoos, polar bears have been known to turn green due to colonies of algae growing in their hollow hair shafts?

How does an unborn chick breathe inside its shell?

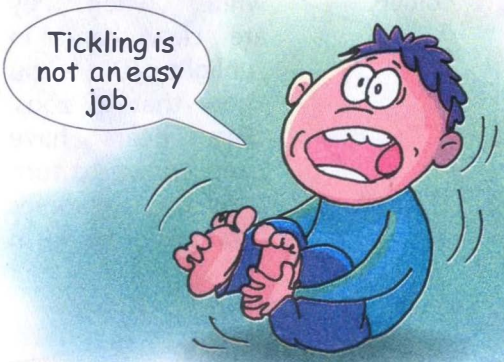
Every animal needs oxygen to live- and this includes chicks that are still inside the egg.

Human babies – and the babies of some animals that grow directly inside their mother's bodies- have an umbilical cord that takes in oxygen from their mother's bloodstream, and gets rid of carbon dioxide that is produced as waste. But animal babies that develop inside shells have no umbilical cord. Instead, they depend upon an air sac filled with oxygen that lies between two membranes which



Why can't you tickle yourself?

When someone tickles you under your arm, or on the soles of your feet, you start laughing uncontrollably. You are tickled mostly because of surprise. Even if you know you're about to be tickled, you don't necessarily know where, so you react by being ticklish. When you try to tickle yourself, it usually doesn't work, because your brain already knows how you're going to do it. To put it simply, you can't tickle yourself because



are directly under the hard shell of the egg. As the baby grows, it uses the oxygen in the air sac, and releases carbon dioxide into it. The carbon dioxide is then released into the air through very, very tiny holes in the shell - and fresh oxygen is taken in too. In this way, a chick is able to breathe and grow.

you can't surprise yourself! The feeling you have when you are tickled is actually similar to what you feel when bugs or spiders crawl on you. Your reaction to tickling is actually the brain's reaction to an unexpected sensation, whether it is a tickle, or the crawly feeling of an insect on your body.

Animal Loudspeaker

The blue whale is the loudest animal on Earth. It produces a sound of 188 decibels that can be detected 800 kilometres away. The blue whale is much louder than a jet engine, which reaches only 140 decibels!

Why don't we have hair on our palms?

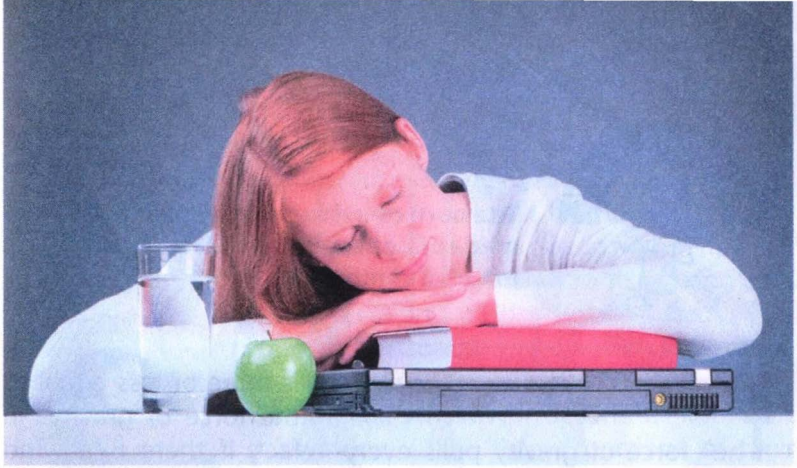
We have hair on almost every part of our body except in a few places like the palms of our hands, and the soles of our feet. This is because the skin has two layers- the epidermis, and the dermis.

The epidermis or outer layer contains sweat glands, nails, and hair follicles from which hair grows. Because the hands and feet are the parts of our bodies which most commonly come into contact with our environment, the epidermis is thicker in these areas to protect us.

This thicker epidermis means that hair follicles don't form – and as a result, no hair grows in these regions. Moreover, the palms and soles, contain excessive nerve terminals, for they are the antennae of our body. If hair grew there, this would affect the sensitivity of these regions, and this is another reason why hair does not grow on our palms.

Insects Sounds

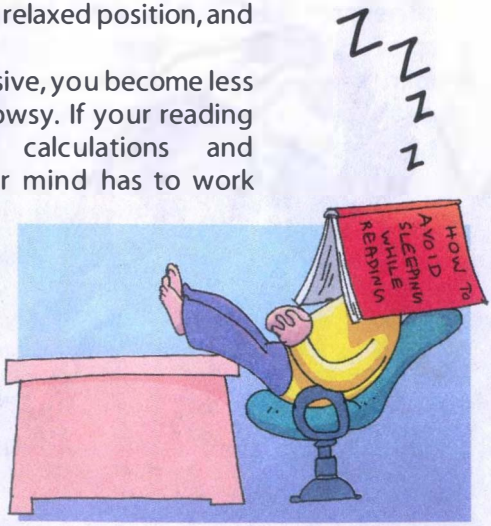
Insects don't make sounds with vocal chords. Instead, the sounds produced by insects like bees and mosquitoes are created by the rapid movement of their wings.

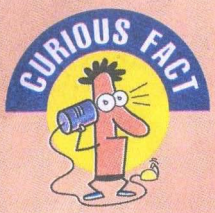


Why does reading make us sleepy?

Many people like to read before going to bed, as reading makes them feel sleepy. The reason for this is that reading has an almost hypnotic effect on a person, as it involves rhythmic eye movement, a relaxed position, and focused attention.

Your body becomes passive, you become less alert, and start feeling drowsy. If your reading involves mathematical calculations and deductive reasoning, your mind has to work hard too, and this can make you feel tired and sleepy as well. A useful tip- if you get sleepy while doing your schoolwork, don't lie down and study. Sit straight, and take a little walk whenever you feel yourself nodding off!





Hair or Bone?

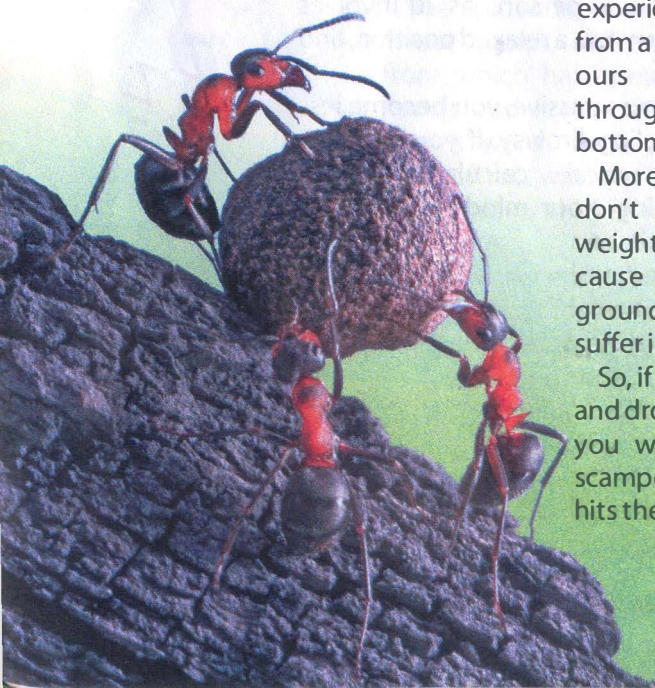
The horn of a rhino may appear to be made of bone, but is not. It is actually made of compacted hair!

Why don't ants get hurt when they fall?

The force of gravity pulls everything that is up in the air towards the Earth- and at the same time, air gives an upward thrust called 'lift' to flying bodies. A flying body falls to Earth when the force of gravity is stronger than the lift. In the case of ants, the lift is more or less equal to the force of gravity- in fact, if there is a wind blowing, an ant that is falling, will float away. From the ant's point of view, the very atmosphere itself is thick and viscous, and its experience of falling from a height is similar to ours when we fall through water to the bottom of a pool.

Moreover, ants simply don't have enough weight and mass to cause them to hit the ground hard enough to suffer injury.

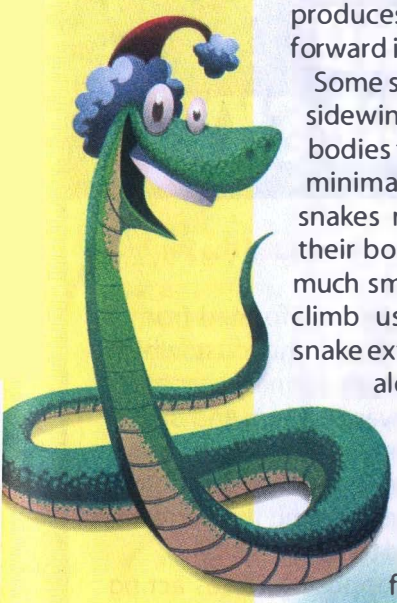
So, if you pick up an ant and drop it from a height, you will see it happily scampering away after it hits the ground.

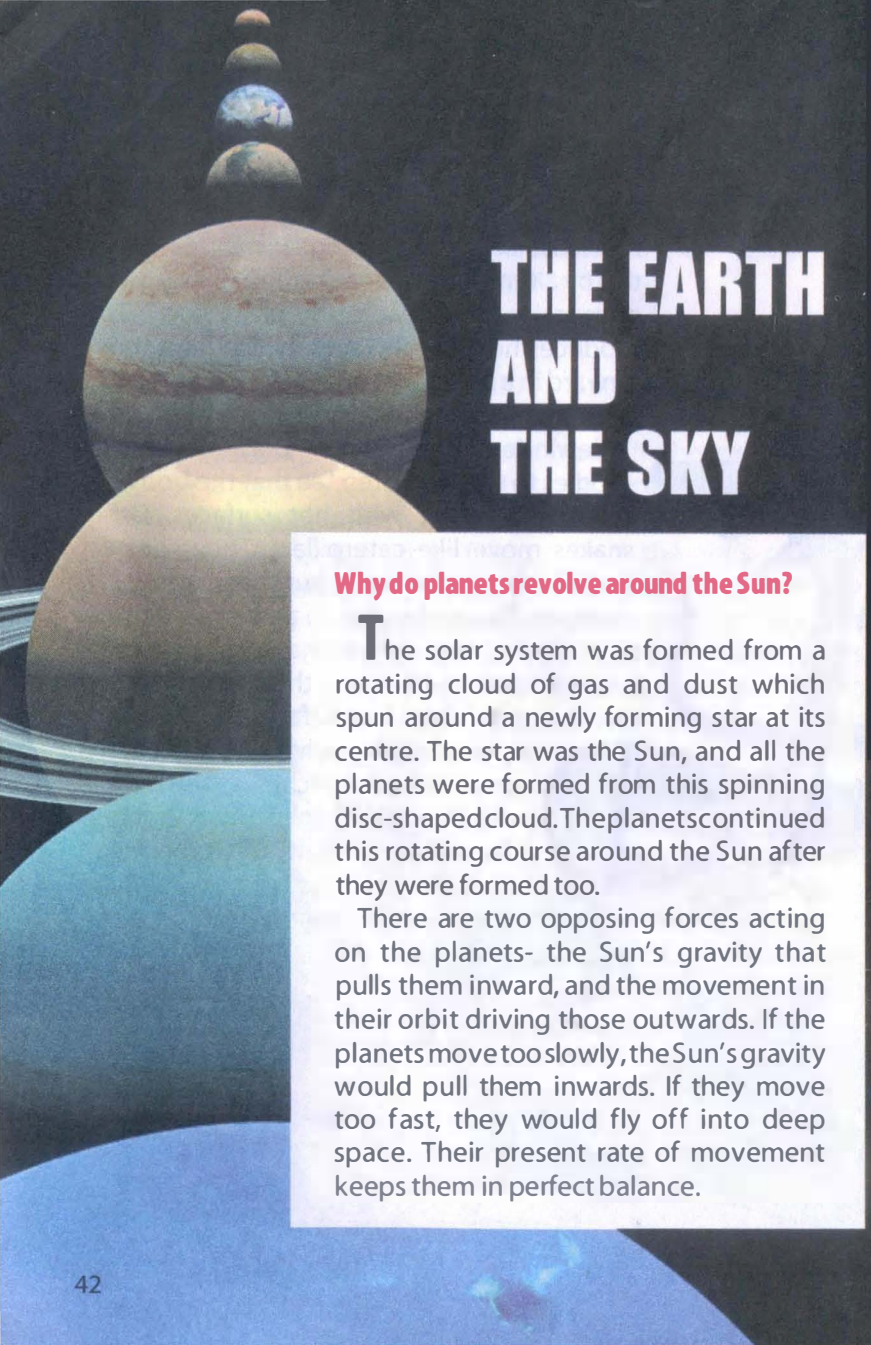


Why do snakes move in a zigzag manner?

Snakes have no legs, yet they can move very fast. If you watch a snake slithering, you will see that it usually moves in a zigzag manner. Itdoes this by alternately tightening and relaxing a set of muscles along each side of its body. This produces horizontal waves, which let it move forward in a zig zag manner.

Some snakes that live in deserts are known as sidewinders. They 'throw' portions of their bodies to the next 'step,' so that the body has minimal contact with hot surfaces. Other snakes move like caterpillars. They contract their bodies into curves, but these waves are much smaller, and curve up and down. Snakes climb using the concertina technique. The snake extends its head and the front of its body along the vertical surface, and then finds a place to grip with its scales. To get a good hold, it bunches up the middle of its body into tight curves that grip the surface, while it pulls its back end up. It then springs forward again, to find a new place to grip with its scales.



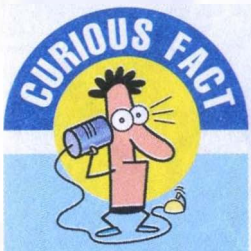


THE EARTH AND THE SKY

Why do planets revolve around the Sun?

The solar system was formed from a rotating cloud of gas and dust which spun around a newly forming star at its centre. The star was the Sun, and all the planets were formed from this spinning disc-shaped cloud. The planets continued this rotating course around the Sun after they were formed too.

There are two opposing forces acting on the planets- the Sun's gravity that pulls them inward, and the movement in their orbit driving those outwards. If the planets move too slowly, the Sun's gravity would pull them inwards. If they move too fast, they would fly off into deep space. Their present rate of movement keeps them in perfect balance.

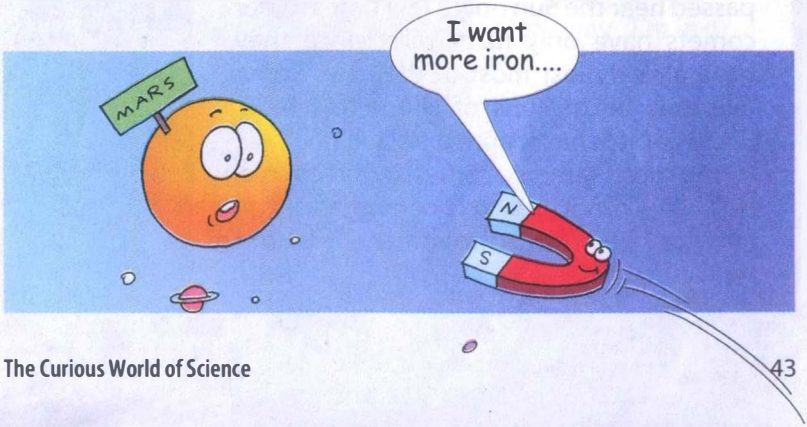


No Eyelids

Snakes have no eyelids like ours. Instead, they have a transparent moist shield over their eyes. Therefore, a snake can never blink or close its eyes.

Why is Mars red?

The planet Mars is rusty red in colour. The reason for this is that the rocks on Mars contain a lot of iron. Iron combines with the oxygen present in the air to form iron oxide or rust. This is why iron becomes a rusty red colour after it has been outside for some time. The iron oxide on Mars would have formed a long time ago, when the planet had some water. This rusty material was transported around the planet in dust clouds, covering everything in a layer of rust. Some scientists believe that the iron present on Mars was pushed up from the volcanoes that used to erupt. Solar radiation caused the atmospheric water vapour present to react with the iron and form iron oxides or rust. While red is a common rust color, some iron oxides are brown, black, yellow and even green. So Mars is not actually all red, though it is called the Red Planet. There are some other colours present on Mars too.



Why does a comet have a tail?

Have you seen a comet streaking across the sky? If you have, you would have noticed that it has a fiery tail. A comet is actually a crumbly body of rock and ice that is flying around in space. When it passes near the Sun, it becomes glowing hot.

Halley's Comet

As the ice melts, gases and dust are thrown into space. Clouds of particles flying out from the Sun, known as the solar wind, push back the dust and gas to form the comet's tail. The clearest tails can be seen on comets that have passed near the Sun only a few times- older comets have only fuzzy tails, since they have already lost most of their ice. Some tails can be millions of kilometres long. Some comets have more than one tail.

The most famous comet is, of course, Halley's Comet, which is named after the famous English astronomer Edmund Halley.

Why do meteors occur?

If you see a streak of light high up in the atmosphere, it is probably a meteor, though some people call them falling stars, or shooting stars.

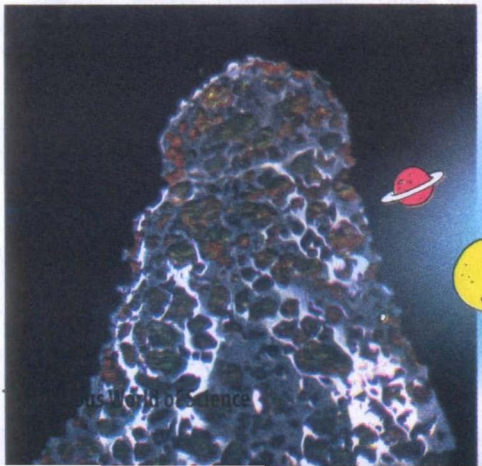
Meteors occur when tiny pieces of rock, ice, and dust particles called meteoroids, plunge at very high speeds through the Earth's atmosphere. The, meteoroid burns up because of the resulting friction, leaving behind the white hot trail that we see.

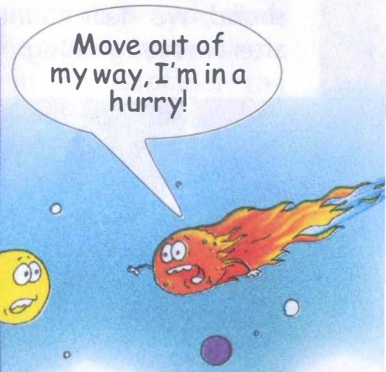
Meteoroids orbit the Sun like planets, some individually, others in long swarms. If the Earth's orbit passes through one of these swarms, a meteor shower is seen. Meteor showers are generally seen on the same date every year, when the Earth's orbit crosses the swarm once again.

Smart Dogs

Dogs can hear sounds that are four times further than the distance from which we can hear a sound. Their sense of smell is a thousand times more sensitive than ours too.

A Meteorite Fragment





Why does thunder follow lightning?

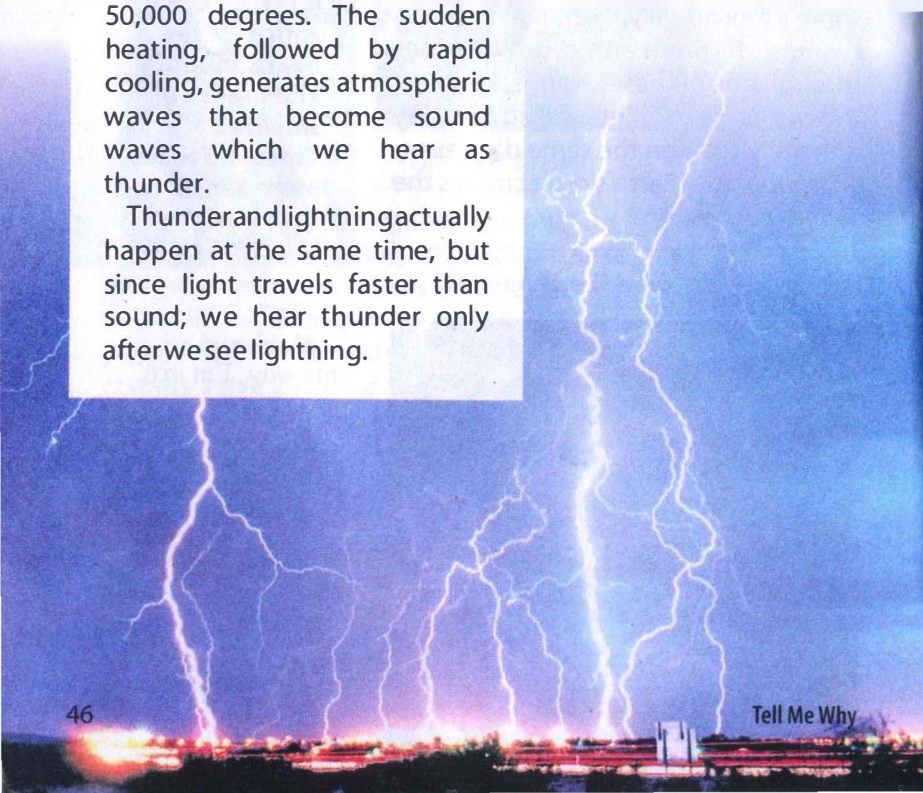
When you see a flash of lightning, you tend to clasp your hands over your ears, and wait for the thunder to roll.

Thunder always comes after lightning for several reasons. Lightning is actually a huge spark of electricity. A lightning bolt heats the air through which it passes – a tube of air perhaps 1.27 cm in diameter – to at least 50,000 degrees. The sudden heating, followed by rapid cooling, generates atmospheric waves that become sound waves which we hear as thunder.

Thunder and lightning actually happen at the same time, but since light travels faster than sound; we hear thunder only after we see lightning.

Amazing Dolphins

Dolphins breathe through a hole on top of their head, called a blowhole. They can communicate very well, using clicking, squawking, chattering and whistling sounds.



Why is it cooler as we climb a mountain?

You might have noticed that when you climb a mountain, as you go higher and higher, it gets cooler and cooler.

This is because the Earth's atmosphere is like a blanket covering the planet. Heat from the Sun enters the atmosphere, and remains below it. Without an atmosphere, the Earth would be a frozen wasteland because heat would not remain on the planet. The higher you go in the atmosphere, the thinner this blanket of air gets. The thinner it gets, the less heat it is capable of holding in. When you climb to the top of a mountain, or fly in an airplane, the atmosphere is so thin that there is a drastic difference in temperature. To put it in a nutshell, it gets colder the higher you go, because the thinner atmosphere allows more heat to escape back into space.

A Compass

Why does a compass needle always point to the North?

A compass is an instrument that tells us the directions. Its needle, which has a magnet in it, spins freely whichever direction you are facing- but it will always settle down pointing to the North.

The actual cause of the magnetism has to do with the interior of the Earth. The centre of the Earth has a molten metallic ironrich core that is spinning continuously. It is believed that the metals in the core have many loosely bound electrons, and that these particles can conduct electricity. It is this mass of moving electrons which produces the magnetic field, which in turn, moves the needle of a compass.

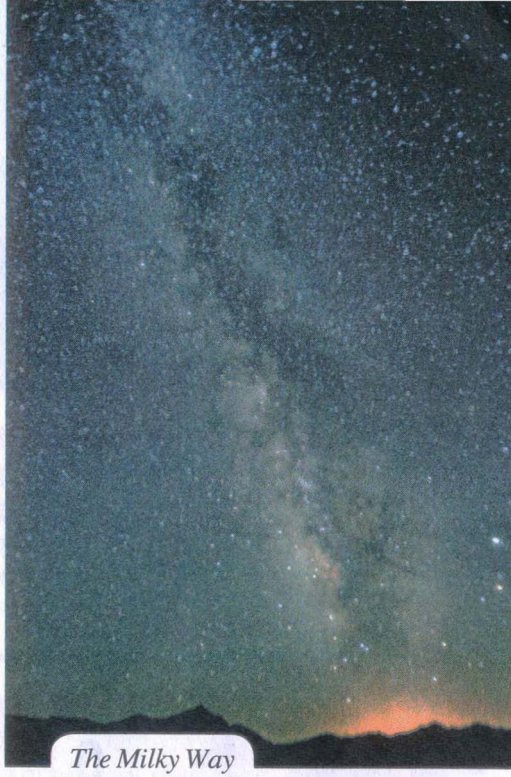
The Incredible Cheetah

Cheetahs are so fast that when they start to run, they can reach 113 km per hour in just a few seconds. Their eyesight is incredible too- they can spot a prey from almost five km away!

Why does the Milky Way look patchy?

A galaxy is a huge collection of stars, dust, and gas. Galaxies usually consist of up to a trillion stars. There are hundreds of billions of galaxies in the universe, in different shapes, sizes and brightness. Our planet, Earth, is part of a huge galaxy called The Milky Way. Our Sun and its planets are about half way out from the centre. The Sun orbits the centre of this galaxy.

The Milky Way is shaped like a huge whirlpool that rotates once every 200 million years. It is made up of at least 100 billion stars, as well as dust and gas. It is so big that light takes 1000 years to cross from one side to the other! In some parts of the galaxy, the stars are close together, and the galaxy shines brightly. This is why the Milky Way looks patchy.



The Milky Way

Miles and Miles

Your body has miles and miles of blood vessels. If they were laid end to end, they would stretch for 99,000 kilometres. This is enough to circle the Earth 2.5 times.

Why does the setting Sun appear red?

All of us have, at some time or other, admired spectacularly red sunsets- but have you ever wondered what gives the Sun its red colour at sunset and sunrise?

Why do stars twinkle?

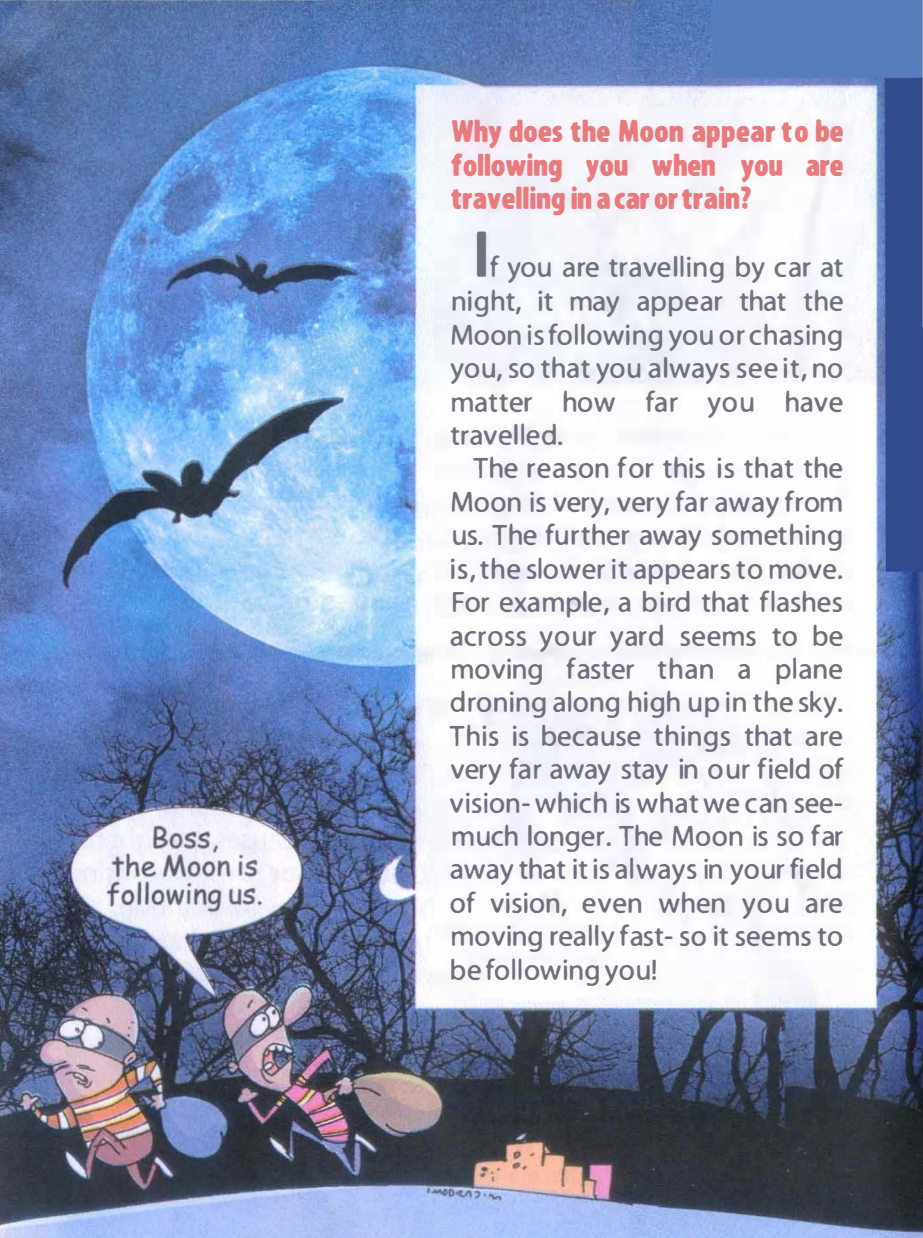
Out in space, stars do not twinkle. It is only when you look at them from Earth that they appear to do so. Stars are really very large, but they are so far away from us, that they seem to be just points of light.

Starlight comes toward Earth along a path through space that produces very little change in the light. However, on Earth we see stars by looking through our planet's atmosphere, which is a thin shell of gases surrounding our planet. The Earth's atmosphere is in constant motion, with pockets of hot and cold air

The reason is that sunlight has to pass through the atmosphere before it reaches us. Sunlight is composed of seven colors – violet, indigo, blue, green, yellow, orange and red. In the mornings and evenings, when the Sun is near the horizon, the rays have to travel a path in the atmosphere that is about fifty times longer than the path that they have to travel at noon.

The dust and water vapor present in this path scatter away these colours differently. Violet, indigo and blue are scattered the most, and red and orange are scattered the least. That is why most of these two colours reach our eyes. As a result, the rising and setting Sun appear red.

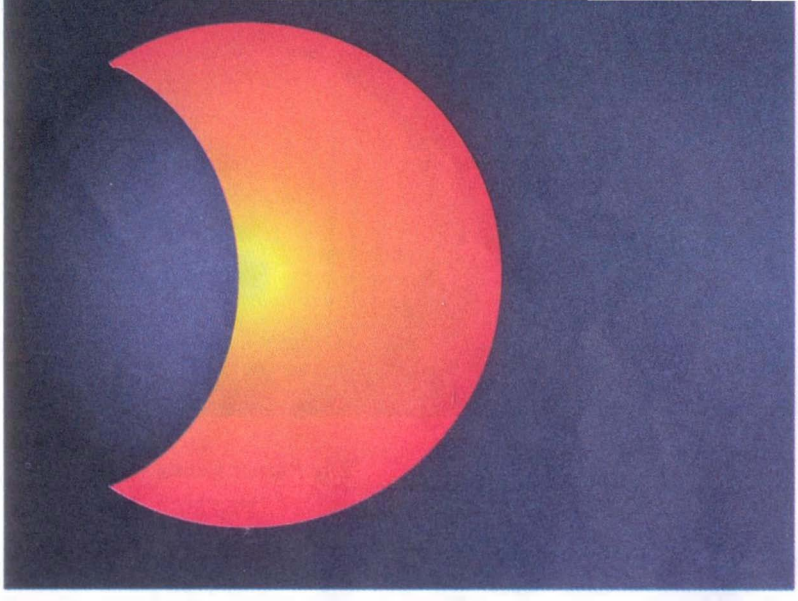
moving around constantly. Light rays bend differently in cold air and hot air. The motion of hot and cold air pockets causes the light rays from a star to move continuously too. In addition, the pockets of moving air also focus and defocus the starlight, so that its brightness keeps changing. Both of these effects together produce the sensation that we call 'twinkling' of stars.



Why does the Moon appear to be following you when you are travelling in a car or train?

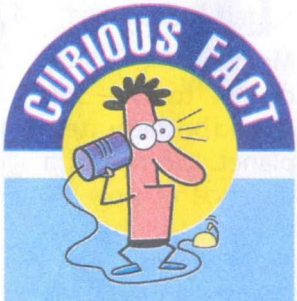
If you are travelling by car at night, it may appear that the Moon is following you or chasing you, so that you always see it, no matter how far you have travelled.

The reason for this is that the Moon is very, very far away from us. The further away something is, the slower it appears to move. For example, a bird that flashes across your yard seems to be moving faster than a plane droning along high up in the sky. This is because things that are very far away stay in our field of vision- which is what we can see- much longer. The Moon is so far away that it is always in your field of vision, even when you are moving really fast- so it seems to be following you!



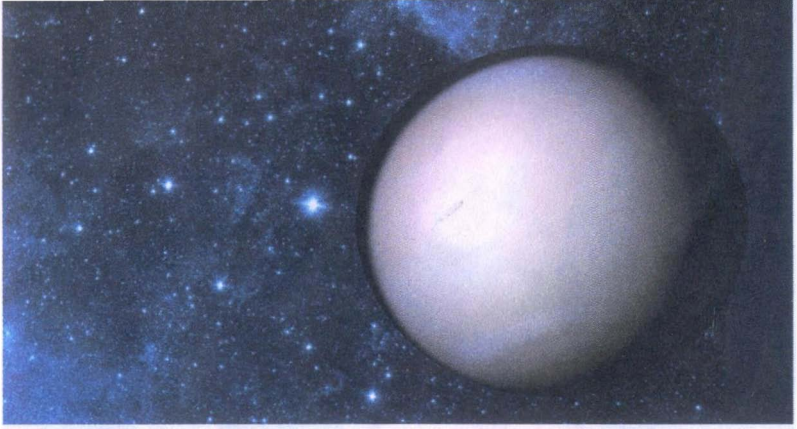
Why is a half moon called a quarter moon?

The Moon is a sphere, though the full moon looks like a circle to us on Earth. During full moon, the Earth, Moon, and Sun are in approximate alignment, but the Moon is on the opposite side of the Earth, so the entire sunlit part of the Moon is facing us. What we see as a full circle is actually just half of the Moon's surface. When the Moon has completed a quarter of its orbit around the Earth, from the full moon position, it looks like half a circle and it is called a half moon. However, since we are seeing just a quarter of its surface area, it is also called a quarter moon.



Invisible Bears

A polar bear's fur is so transparent that it is nearly undetectable by infrared cameras.



The Planet Venus

Why is Venus the hottestplanetthough Mercury is the closest to the Sun?

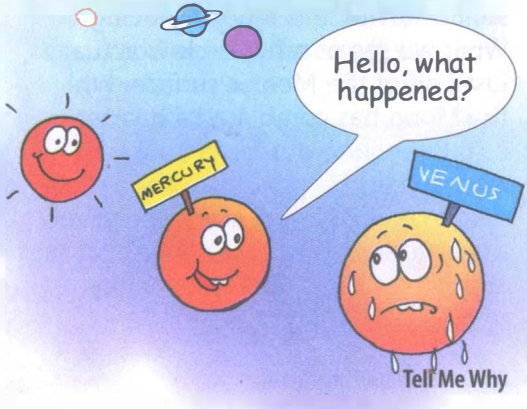
Logically, Mercury, the planet closest to the Sun should be the hottest planet. It orbits at a distance of only 58 million kilometres from the Sun.

Sure, Mercury is hot, but Venus is hotter! Venus is much further from the Sun, orbiting at a distance of more than 108 million kilometres.

Why is Venus hotter than Mercury?

The answer is simple. Mercury is an airless world, not unlike the Moon.

Venus, on the other hand, has a very thick atmosphere of carbon dioxide, which adds incredible pressure, and traps in the heat. This just goes to show that the temperature on the surface of a planet depends more on its atmosphere, than its closeness to the Sun.



Giant Eyes

Giant squids have the largest eyes in the animal kingdom. Their eyes are 25 to 40 centimetres – about the size of a dinner plate.

Why do clouds have differentshapes?

Clouds are made up of tiny drops of water vapour or ice particles- or both.

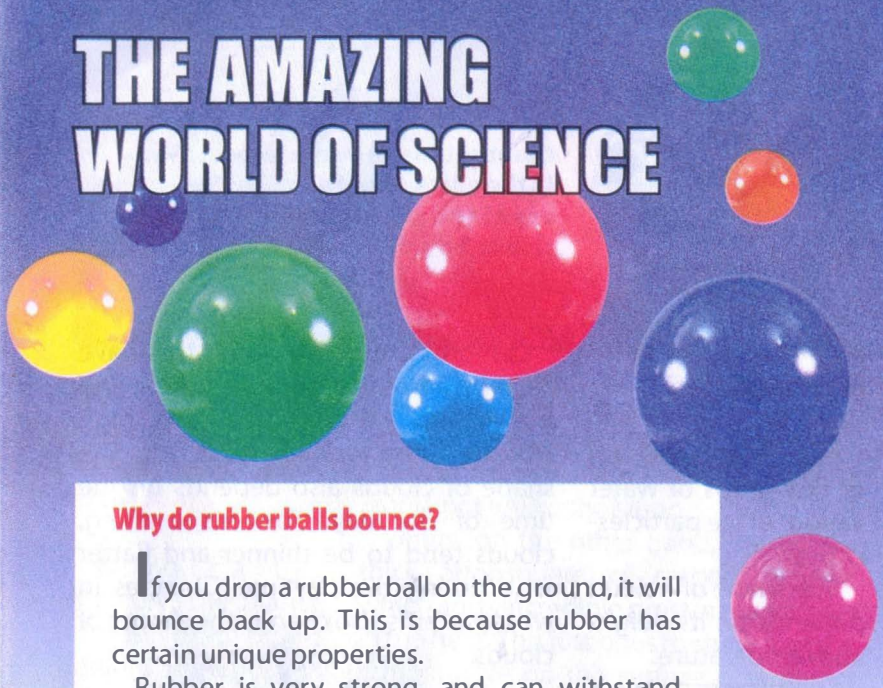
The shape of a cloud depends on its height and temperature.

Cumuliform clouds are shaped like mushrooms and are formed when rising warm air cools as it goes up.

Stratiform clouds come in flat, dull layers, and are formed when air sinks in a high pressure area, creating a layer of cold air near the ground that doesn't rise, or rises only very slowly.

Cirriform clouds are clouds that have risen on a front or tropical cyclone and frozen into ice crystals at very high altitude. They look like thin hair. The shape of clouds also depends on the time of the day. Towards evening, clouds tend to be thinner and flatter than during the daytime. Changes in wind patterns also change the shapes of clouds.

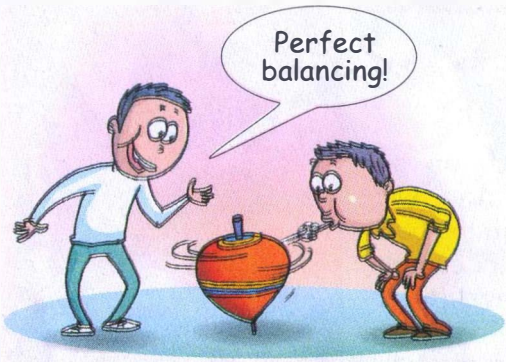
THE AMAZING WORLD OF SCIENCE



Why do rubber balls bounce?

If you drop a rubber ball on the ground, it will bounce back up. This is because rubber has certain unique properties.

Rubber is very strong, and can withstand severe deformation of its shape without becoming physically damaged. When you drop a ball, it doesn't break or shatter- instead, its shape is deformed as it hits the ground, but it quickly regains its original shape. This is because of another important property of rubber- it is elastic.Elasticity is the tendency for an object to retain its shape. When you drop a rubber ball, the part of the ball that hits the ground becomes flattened. Rubber's high elasticity causes the ball to spontaneously return to its round shape. This spontaneous return to its original shape pushes the ball against the ground, and makes it spring back up into the air.



Why doesn't a spinning top topple while spinning?

A spinning top will remain upright as long as it is spinning. As it slows down, it starts to wobble, and tilt over until it falls, and hits the ground. This is because the top is so designed that while it is spinning, it is perfectly balanced on its tip. When the top is spun, imagine it spinning very slowly, from the side. When the energy is on the right side, the top is heavier on that side, and tries to fall over, but before it does, the weight has moved to the left side, trying to make it fall that way.

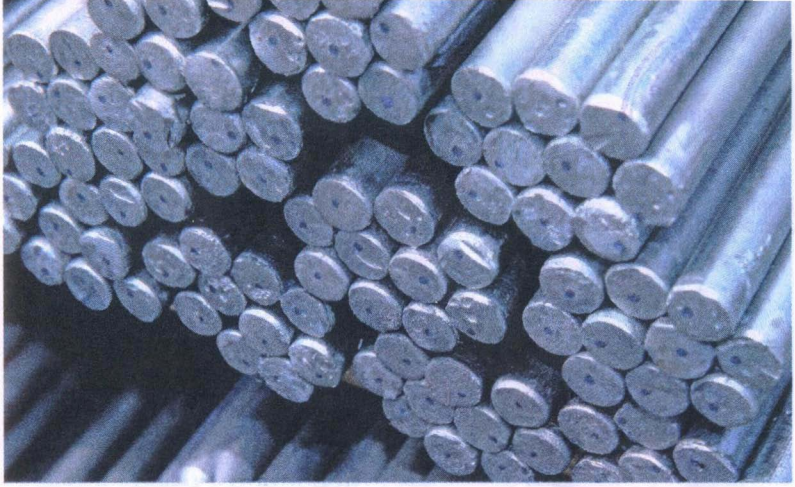
So, the top remains balanced, and stays upright while it spins. Eventually, friction between the top and the table makes the top spin slower, and if you watch it carefully, you will see it wobble, before it falls over and stops.

Why does an electric fire glow red?

When you switch on an electric heater, electricity will begin to flow through the bars of the heater. An electric current consists of a flow of tiny particles called electrons.

As the electrons pass through the wire in the bars of an electric fire, they collide with the molecules of metal in the wire. This makes the molecules vibrate faster, and the metal becomes hotter. In this way, electric energy is changed into heat energy, and the bars start giving out warmth.

At the same time, if any object gets hot enough it starts to give out light energy as well as heat energy, and it will start to glow- first red, then yellow, and finally white. This happens with the bars in the electric fire, and they will soon be hot enough, so that they glow red. However, they do not become hot enough for the glow to become white.



Why does metal feel cold?

You must have noticed that anything made of metal feels cold to the touch. This is because metal is a good conductor of heat, and heat flows through it easily. Your fingers are warm from your body heat, and when you touch a metal surface, the heat from your fingers flows to the surface of the metal. Because metal is a good conductor of heat, the heat moves on through the metal, so that it stays cooler than your skin- and heat continues to flow from your fingertips to the metal. When the skin on your fingers loses heat, it feels cold, and as a result, the metal feels cold too.

Why are there only ten numbers with single digits?

There are only ten single digit numbers- 0,1,2,3,4,5,6,7,8, and 9. One reason for this is because our ancestors probably started counting using their fingers and thumbs- which are 10 in all. The Romans used letters instead of numbers- for example, 100 was represented by the letter C- but this made calculations very difficult. Having a 0 along with nine other single digit numbers makes it easy to add, subtract, divide, or multiply. Computers have only 2 numbers, 0 and 1- and this system of numbering is called a binary system. The system of numbering using ten single digit numbers is known as the decimal system.

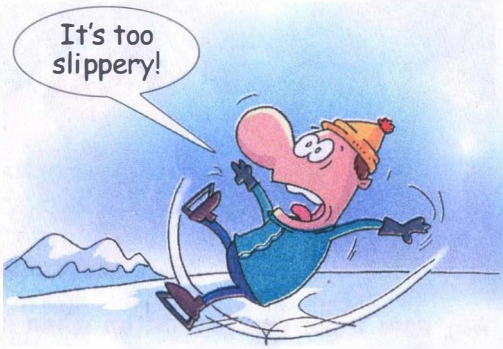
Radio in Space

Radio waves can travel through space, but not through water. This is why you can listen to the radio on a spaceship, but not in a submarine.

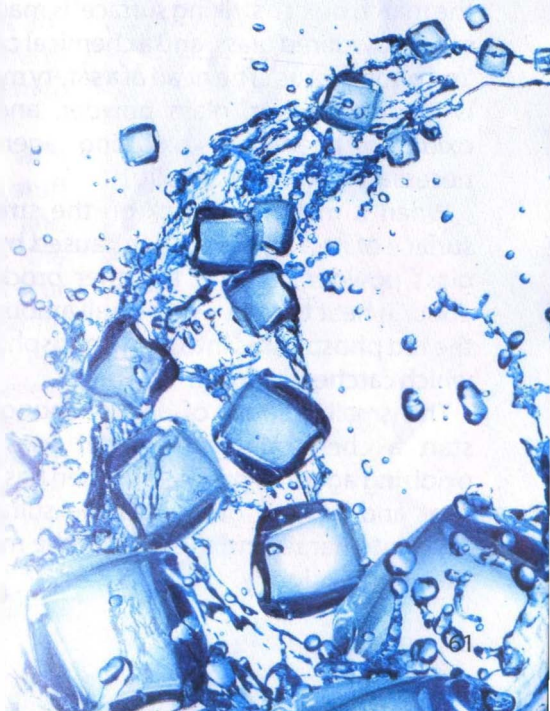
Why is ice slippery?

If you pick up a piece of ice, it will slip from your fingers, if you are not careful. This is because the warmth of your fingers melts the top layer of ice, forming a film of water between your fingers and the ice that makes it slippery. However, if the ice is very cold, it will stick to your fingers. Why is this? It is because the film of water that was formed freezes immediately because of the extremely low temperature of the ice, and this makes the ice stick to your finger.

You must have seen people skating on ice, and wondered why they do not fall. The reason is because the speed of a skate rushing across the ice produces heat, which melts the ice. The skater slides on the



film of water that is formed, and the film freezes back to ice as soon as the skater has moved away. To put it in a nutshell, ice is formed when water freezes- and it is water that makes ice slippery.



Why does a matchstick light up when it is struck?

Did you know that striking a match causes a chemical reaction? A safety match can only light when someone strikes it against the striking surface on the side of the match box. A 'striking surface' is made of sand, powdered glass, and a chemical called 'red phosphorus'. The head of a safety match is made of sulfur, glass powder, and an oxidizing agent. An oxidizing agent is necessary to keep a flame lit.

When a match is struck on the striking surface of its box, the friction caused by the glass powder rubbing together produces enough heat to turn a very small amount of the red phosphorus into white phosphorus, which catches fire in air.

This small amount of heat is enough to start a chemical reaction that uses the oxidizing agent to produce oxygen gas. The heat and oxygen gas cause the sulfur to burst into flame, and the head of the match then burns brightly.

Elephant Eaters

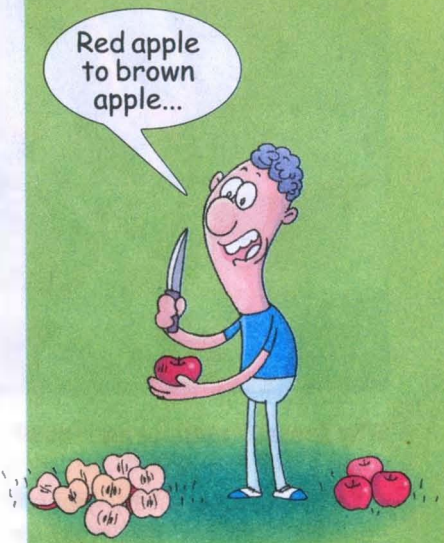
We eat about a kilogramme of food every day. This adds up to around 30 tonnes of food during a lifetime- which is the weight of six elephants!

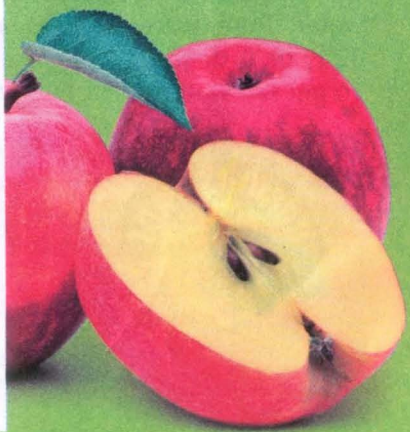
Why do cut slices of apple and potato become brown?

All cells contain thousands of enzymes. These enzymes do all of the work necessary for the cell to live its life.

The actual mechanism that causes browning in apples and potatoes involves an enzyme called polyphenol oxidase, also known as tyrosinase, and an amino acid called tyrosine. Amino acids are used to build proteins. Once you cut the fruit, you open up some of the cells, and expose them to the oxygen in the air.

Oxygen combines with tyrosine to make a dark stuff called melanin, and tyrosinase speeds up the process. That's why a cut apple darkens. And the same thing happens to a cut banana or potato. The easiest way to prevent browning is to put the sliced apples, bananas, or potatoes in water so that the enzyme does not have access to oxygen.





A Special Vehicle used to remove Snow from the Roads.

Why does salt melt ice and snow?

In cold countries, people sprinkle salt on the road or sidewalk in winter, to help melt the snow and ice. Salt melts ice essentially because adding salt lowers the freezing point of the water. Pure water freezes at 32°F, or 0 degree Centigrade. To get salt water to freeze, you have to make it colder than 0 degrees. So, when you add salt to ice, the ice melts, and salt water is formed. The salt water is unable to re-freeze except at a much lower temperature, and so, roads and sidewalks can remain ice free.

Black is Hot

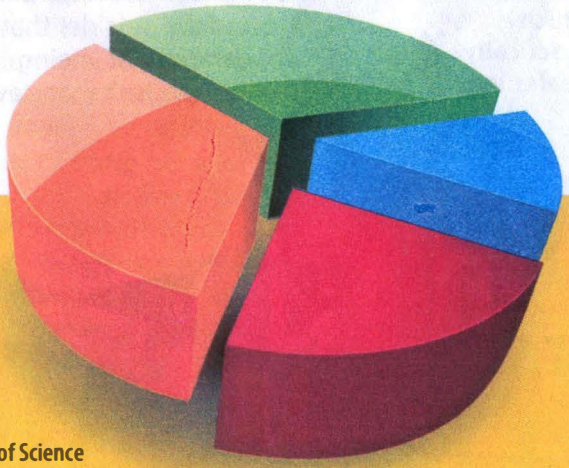
Black absorbs all the colours of light, and light that is absorbed, turns into heat. So, something that is black in colour will be hotter than something that is white- which is why we wear dark clothes in winter, and white clothes in summer.

Why is the circle divided into 360 degrees?

Scientists theorize that ancient cultures, such as the Babylonians and Sumerians, created a calendar depicting 360 days in a year. They created 12 months, each with 30 days, making a total of 360 days.

The Ancient Babylonians also had a number system based on 60. They took a hexagon and circumscribed a circle around it, and found that the circumference around the hexagon is exactly equal to 6 times the radius of the circle. Since the number 60 was the base of their numerical system, they considered the radius to be 60 – and 6 times 60 is 360.

So, they divided the circumscribed circle into 360 equal degrees, and to this day, a circle is said to be made up of 360 degrees. Another simpler explanation is that you can divide a circle into 4 equal parts. Each part of the circle, once divided, will have a 90 degree angle, and the whole circle will have 4 x 90 degrees, or 360 degrees.



Deafeningly Loud

One of the loudest sounds that we can hear is that of a jet plane taking off. Sound is measured in decibels. An aircraft at take off reaches 180 decibels, which is practically deafening.

How do stripes get into toothpaste?

If you use striped toothpaste, you might have wondered how the stripes got in there, and why the colours don't smudge, or run into each other. The answer lies in clever engineering. Striped toothpaste is essentially white toothpaste. In the neck of the tube, very close to the nozzle which squirts the toothpaste out, there are other little nozzles attached to bags of colour. So, when you squeeze a tube of toothpaste, you squeeze both the main tube, and those little bags as well. As the white toothpaste comes out, the extra coloured bits get squeezed out on the outside, and you end up with a tube of white toothpaste with little coloured bits around the outside, that give it the appearance of being a striped toothpaste. Isn't that clever?

Why does a soccer ball have patterns of pentagons and hexagons on its surface?

If you love watching soccer, you may have noticed that the surface of the ball is marked with twelve black pentagons- or figures with five equal sides- and twenty white hexagons, which are figures with six equal sides. The reason for this lies in mathematics. It has been proved that it is impossible to make a perfect sphere out of a flat surface- there will always be wrinkles or distortion.

Manufacturers of soccer balls need to create an inflatable ball that will become an almost perfect sphere from a flat shape. They solved the problem by making a ball consisting of a patchwork of panels that required minimum stitching.

On the basis of a mathematical theorem, they discovered that these panels should ideally be made up of twelve pentagons and twenty hexagons so that when the panels were inflated, a fairly spherical shape would be obtained in the simplest way possible. This is the reason you see those patterns on the surface of a soccer ball.

Why does polish make your shoes shiny?

When you polish your scuffed shoes, they look bright and shiny. This is because scuffed shoes have irregularities on the surface, which trap dirt. Shoe polish contains wax, which works by filling in all the irregularities, and making the surface smooth again. A smooth flat surface reflects light very well, so light falling on the shoe is reflected back, making it shine. For best results, rub in a small amount of polish using small, rapid, circular movements. Keep rubbing until your shoes start to gleam!

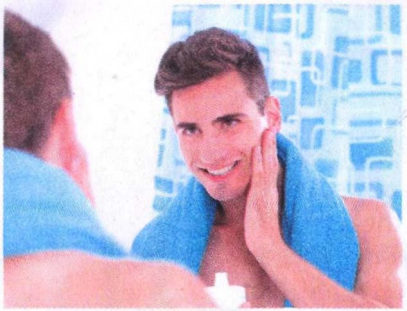
Hottest Temperature

In 2010, The Relativistic Heavy Ion Collider at Brookhaven National Laboratory in USA set the record for hottest temperature ever recorded in a Lab. It was around 4 trillion degrees Fahrenheit. This is some 250,000 times hotter than the centre of the Sun.

Why do the lights of a distant town appear to twinkle?

When you are travelling at night, the lights of towns in the distance appear to twinkle. This is because of the constant movement of air above towns. The air above towns is warm, as a result of the heat given off from buildings. Warm air keeps moving up to be replaced by cold air, which then gets heated, and rises. This constant movement of air is known as turbulence.

When we are near a town, or in it, we don't notice the turbulence, because it is quite small, and the lights are nearby. However, when we are some distance away, the lights are far away too. They appear as only pinpricks. The warm and cold air that make up the turbulence above the town have different densities, and light passing through the layers is bent at different angles because of this difference. As a result, it appears as though the lights of the distant town are twinkling.

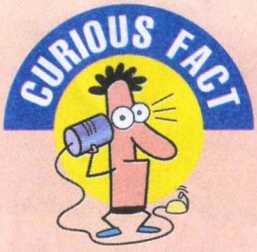


Why does aftershave feel cold on yourskin?

If you dab your dad's aftershave lotion on your face, you will feel a cool, refreshing chill. This is because, alcohol is the main ingredient in aftershave lotions and perfumes. The alcohol serves three purposes. First, it disinfects the skin, so that small cuts caused by shaving do not become infected. Secondly, it dissolves the oils that give off a pleasant fragrance. Finally, alcohol evaporates quickly, and as it does so, it draws heat from the skin. This leaves the skin feeling cool and refreshed. So, on a very hot day, you can cool off by splashing a little aftershave lotion on your face.

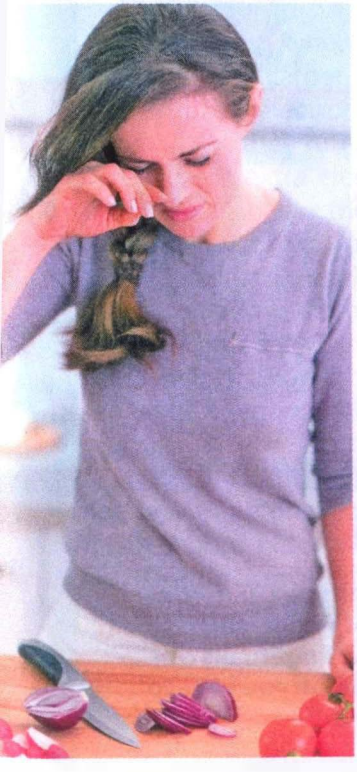
Thin Skin

Our skin is only about 2mm thick. It is made up of two layers- the epidermis, which is on top, and the dermis, which is below. The touch sensors are found in the dermis.



Hairy Facts

The hair on your head is constantly growing- about 2 mm every week. If you don't cut your hair, it can grow as much as a metre in length, before it falls out, to be replaced by new hair.



Why does peeling an onion make you cry?

You must have noticed that when you peel or slice onions, tears will start flowing down your cheeks. This is because, when an onion is cut, you break its cells, releasing their contents. Chemicals known as amino acid sulfoxides are released to form sulfenic acids. Enzymes in the cell, that were kept separate, now are free to mix with the sulfenic acids, to produce a volatile sulfur compound that wafts upward toward your eyes. This gas reacts with the water in your tears, to form sulfuric acid.

The sulfuric acid burns, stimulating your eyes to release more tears to wash the irritant away. Cooking the onion inactivates the enzyme, so that you don't cry anymore! You can also chop the onions in a bowl of water, which prevents the vapours reaching your eyes, and irritating them.

Why do we need two holes to pour a liquid out of a can of juice?

If you punch a single small hole in a can of juice, you will find that you cannot pour it out. This is because, the pressure of air around the hole pushes the juice inward, and prevents it from flowing out. However, if you punch a second hole, you will see that the juice flows freely. When you make the second hole, you let out the air inside the can. So now, the pressure of air inside the can is equal to the outside air pressure.

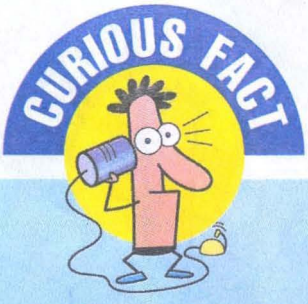
When you tilt the can, the extra pressure exerted by the juice at the first hole allows it to flow out easily. So, basically you need two holes- one to let air in, and the other to let the juice out. Or, if you make just one hole, it should be big enough to let air bubbles in, while allowing the juice to come out at the same time.

Fingernails are Useful

You feel things with your fingertips, and the function of finger nails is to protect them. Long fingernails can also prove useful when you have to pick up a tiny object.

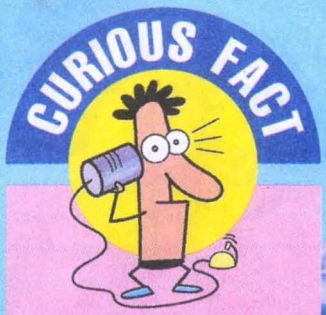
Why do you sometimes see blue sparks when electricity is produced?

Sometimes, when you are walking over a carpet, your shoes pick up extra electrons from the carpet when they rub against the fibres. These extra electrons give your shoes an electrical charge. Now, if you go and touch something like a metal doorknob, the electrons are discharged, and you feel a little shock. If the room is dark when this happens, you may see a blue spark. The spark is caused as the electric charge jumps from your fingers to the doorknob, before you actually touch it. The blue colour comes from the nitrogen atoms in the air. All types of atoms have their own characteristic colour, and nitrogen atoms are blue when they become ionized, or are electrically charged.



Hardworking Heart

Your heart beats once every second- that is, 86000 beats a day, and 31 million beats every year. That's a lot of work for an organ the size of your fist!



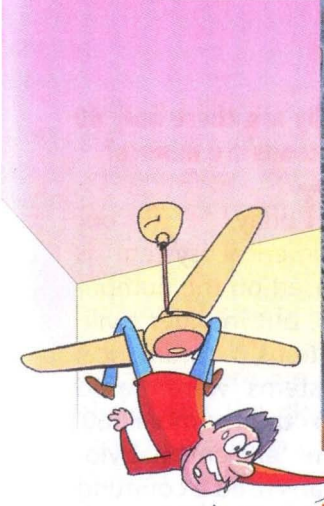
Incredible Water

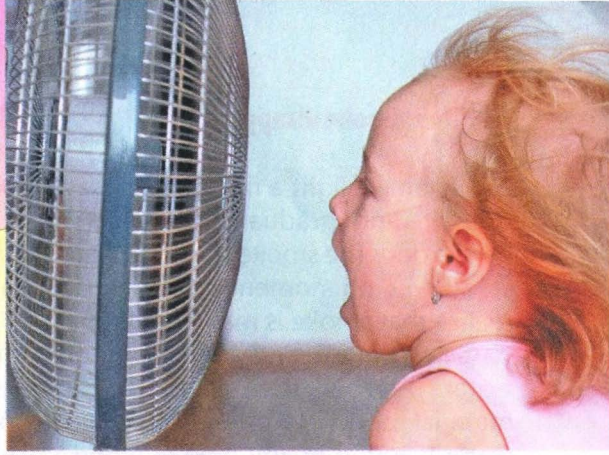
Most liquids occupy less space when they change into a solid form. However, when water freezes into ice, the molecules of water re-arrange themselves, so that they occupy more space. Since ice occupies more space, it is less dense than water- which means that it is lighter than the same volume of water. This is why ice floats on water, though they are both basically the same substance!

Ice Cubes

Why does ice stick to cotton?

If you take a cube of ice straight from the freezer on a warm day, and place it on a piece of cotton, you will notice that the ice sticks to the cotton. This is because the surface of the ice cube melts a little when it comes into contact with the warm air. When you place the ice cube on the cotton, the water will wet it. At the same time, since the ice is at a very cold temperature, it will freeze the water immediately, making the ice stick to the cotton as though it were glued to it!





How does a fan cool a room?

When you enter a room on a hot day, your first action is to switch on the fan, and as its breeze starts blowing, you get relief from the heat. You think the room has become cooler, but actually, most fans do not directly cool the air in a room. Fans work by increasing the rate of evaporation. When it's hot outside, our bodies sweat to maintain our core temperatures. As the sweat evaporates, it takes some of our body heat with it. If the air around our bodies is still, it becomes saturated with water.

A fan moves the air around, and constantly exchanges the water-saturated air around our bodies with fresh, dry air. This allows evaporation to happen more quickly, so we feel cooler. In short, by blowing air around, the fan makes it easier for the air to evaporate sweat from your skin, which is how you eliminate body heat. The more the evaporation, the cooler you feel.

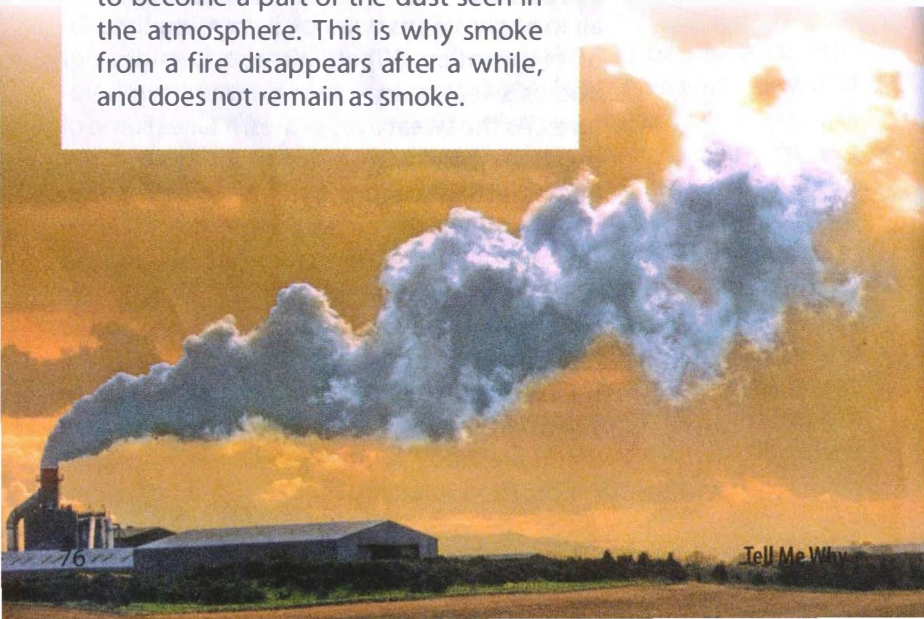
Why does smoke disappear?

When we light a fire, smoke rises from it, and gradually disappears. Where does the smoke go? To understand this phenomenon, you must realize that smoke is made up of tiny particles of ash and tiny drops of water. Ash is the non-burnable material found in a tree's cells, while water is found in any type of wood. The hot air rising from the fire carries these minute particles upwards, in the form of smoke.

As the smoke rises, the drops of water evaporate, to become water vapour. The ash particles spread out, and gradually mix with the air above, to become a part of the dust seen in the atmosphere. This is why smoke from a fire disappears after a while, and does not remain as smoke.

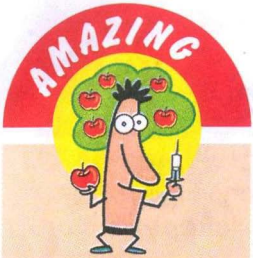
Why are there only 60 seconds in a minute?

Today, our numerical system is based on the number 10, but in older civilizations, numerical systems were based on the number 60. The ancient Babylonians used a counting system built on the number 60, and the ancient Egyptians, using sandfilled hour glasses, are credited



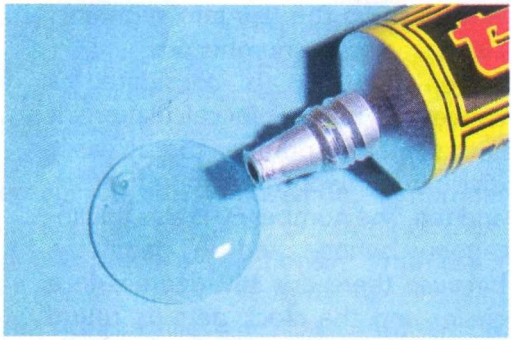
with dividing the day into segments also based on the number 60.

Even now, 60 is considered a convenient number for calculations. It is the smallest number that is easily divisible by two, three, four, five, six, and ten. The number 60 is also advantageous when used in geometry, because there are 360 degrees in a circle- and the clock gets its round shape because a circle can be easily divided by 60 to get sixty minutes, of which each minute is 60 seconds. Isn't it amazing that over 3,000 years ago, Man was smart enough to invent a time accounting system that serves us well even today?



Super Nose

Your nose is a super organ. It can differentiate between 3000 different types of smells, some of them nice, some disgusting. In many cases, smells act as a warning that something is wrong - like the stink of rotten food, or a smell of smoke from the burning fire.



Why doesn't glue stick to the inside of the bottle?

The regular white glue that we use is made up of a variety of chemicals that are either sticky, or stretchy. White glue also contains water. Water acts as a solvent that keeps the glue liquid until you want it to stick.

When you put glue on a piece of paper, the water in it is exposed to air. The water eventually evaporates, and as it does so, the glue dries, hardens, and holds the things that need to be glued, stuck together.

When the glue is inside a bottle, there's not enough air inside the bottle to cause the water to evaporate to make the glue sticky. The bottle protects the glue from the air, and keeps the glue runny. This is also why, if you've ever left the top off a glue bottle for a while, the next time you try to use the glue, it would have dried up.

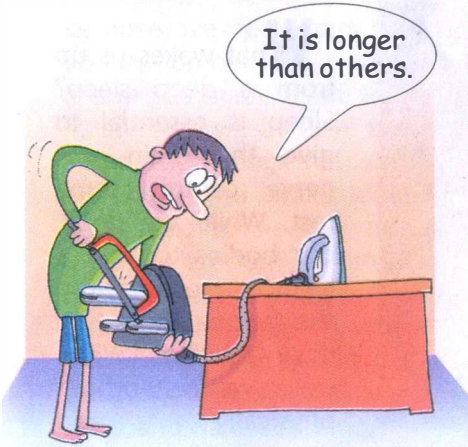
Why is the earth pin of an electric plug longer than the other two pins?

All electrical appliances like washing machines, grinders, or water heaters have plugs that connect to a slot in a socket. Plugs usually have 3 pins- one connected to a live wire, the other to a neutral wire, and the third connected to the earth. The live and neutral wires carry the current around the circuit. Normally, the earth pin does not carry any current.

The earth pin is meant to reduce the risk of electric shock from the external metal parts of the plugged-in device. It is

longer than the other two pins, so that it goes in the socket first. This means the plug is earthed before the live pin is engaged for safety's sake. Many appliances have metal cases, and if the live wire becomes loose inside the appliance, and then touches the case, then the whole case becomes live. If you were then to touch it, a current would flow through you to the Earth, and you would get a serious electrical shock.

The earth wire is just a wire that travels down to the Earth through the earthing system in your house, to deflect the current harmlessly into the ground, in case an appliance becomes live.



Why are viruses different from bacteria?

Viruses and bacteria both cause diseases- but they are quite different. To begin with, they are very different in size. Viruses are much tinier, and the biggest virus is only as large as the smallest bacterium. They differ in structure too. A typical bacterium, which is

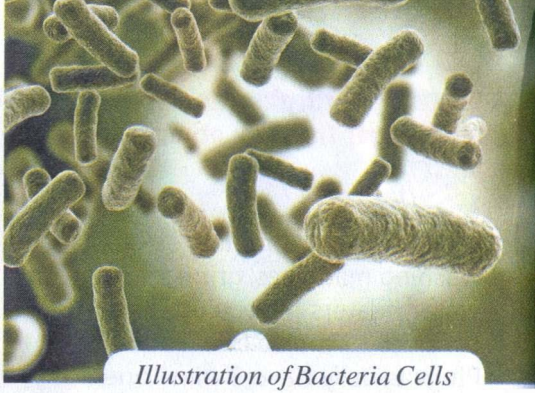
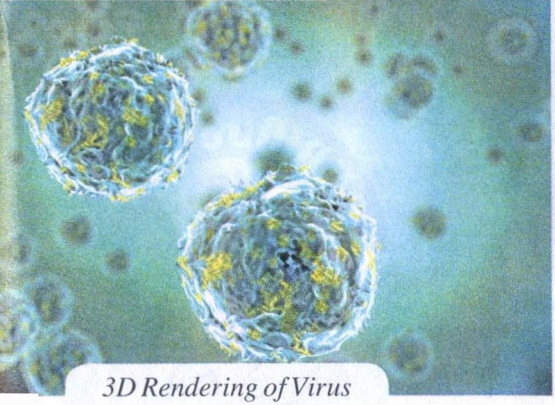


Illustration of Bacteria Cells

the singular form of bacteria, has a rigid cell wall, and a thin, rubbery cell membrane surrounding the fluid, or cytoplasm inside the cell. A bacterium contains all of the genetic information needed to make copies of itself–its DNA. A virus may, or may not have an

Why do we wake up from sleep?

What wakes us up from a deep sleep? Sleep is essential to give the brain and nerve centres some rest. While we sleep, our bodies too get a chance to recover from the fatigue caused by daily activities. When we are well rested, both physically and



3D Rendering of Virus

outermost spiky layer called the envelope. All viruses have a protein coat and a core of genetic material too.

However, the main difference between bacteria and viruses is the way they reproduce. Bacteria are alive, and exhibit growth and reproduction. They multiply in air, water, soil, and in living host cells. Viruses exhibit the characters of both living and non-living things, and multiply only in a living host. They can take over the functioning of an infected cell, and turn it into a factory producing millions more viruses! Viruses are responsible for many ailments includingthecommon cold and influenza.

mentally, we wake up. Sometimes, we wake up because we feel cold or hungry- or because a bad dream has made us afraid. To sum up, we all have an internal body clock that tells our brains to wake our bodies up after sleeping for a certain amount of time. However, some things- or situations - like noise, temperature in the room, or sunshine, interrupt our sleep, and wake us up too.

Hummingbirds

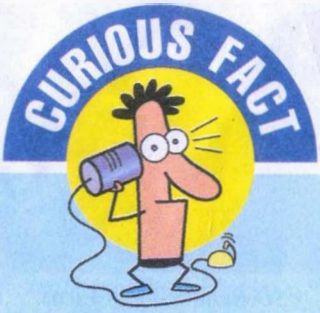
Hummingbirds get their name from the humming sound that they make when they beat their wings- around 50 times every second. The bee hummingbird beats its wings even faster- around 200 times a second!

● *Dev Nath*

Radar Tower of a Ship

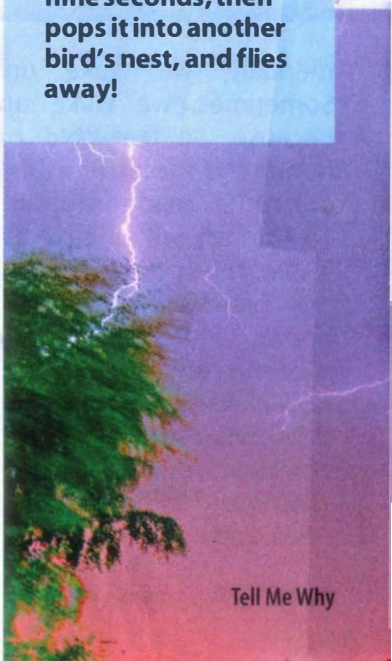
Why do ships use microwaves for navigation?

In the ancient times, sailors used instruments like a maritime sextant to study the angle of the stars, an accurate clock known as the chronometer, and precise maps to navigate ships. However, now these ancient tools have been replaced by modern instruments like radio, radar, and navigation satellites. Today, ships have radar, screens which use microwave radiation to detect distant objects. Microwaves can pass through things that would block ordinary waves, and can be focused into a beam too. The ship's radar sends microwaves in a circle, and the echoes bouncing off distant objects produce an image on the screen.



Fast Work

A bird generally takes about a minute to lay an egg. The cuckoo is a fast worker though. It lays its eggs in just nine seconds, then pops it into another bird's nest, and flies away!



Why does lightning flash?

During a storm, flashes of lightning followed by thunder, light up the sky like fireworks. It is an impressive, and sometimes frightening spectacle. The flash occurs for several reasons. As the air heats and cools, it expands and contracts, and this causes changes in the movement of air, and pressure. The water droplets at the top of a cloud have a positive electrical charge, while those at the bottom of a cloud are negatively charged.

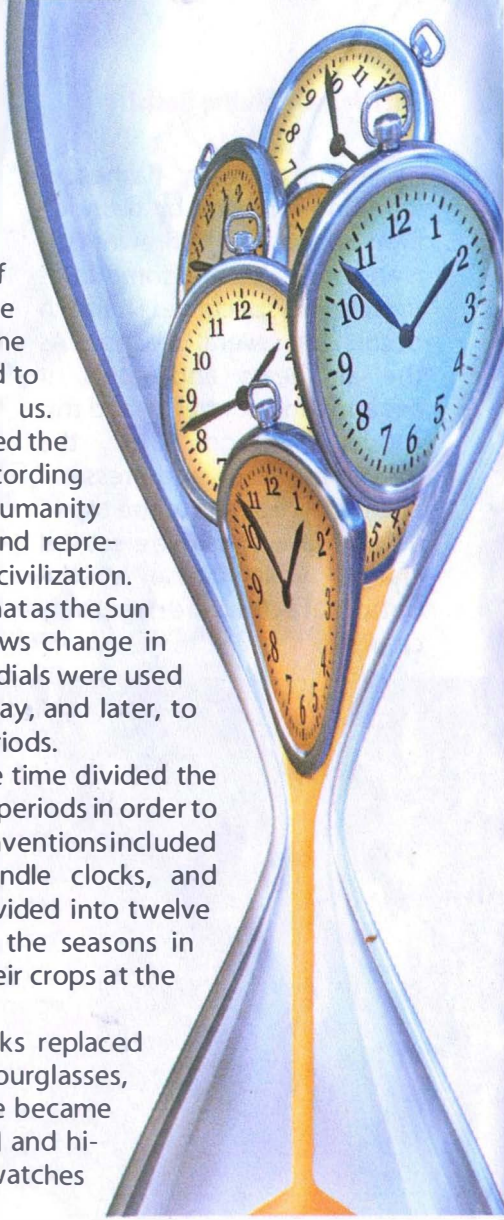
When the clouds are low enough, the negative charge in the water droplets attract a positive charge from the Earth. As a result, electrical energy is released with a flash. This causes the air to be heated to a tremendously high temperature, which in turn, causes the air to expand suddenly with an explosive noise that we call thunder. Though thunder and lightning occur at the same time, we see lightning first, and then hear thunder, because light travels faster than sound.

Why do we measure time?

Ever since Man noticed the movement of the Sun, Moon and the stars in the heavens, and the rhythm of day and night as well as the passage of the season, the concept of time, and the need to measure it have fascinated us. Prehistoric people first recorded the phases of the Moon, and recording time has been a way by which humanity has observed the heavens, and represented the progress of civilization. Ancient civilizations noticed that as the Sun moves across the sky, shadows change in direction and length, and sundials were used to measure the length of a day, and later, to divide the day into specific periods.

Early inventions to measure time divided the day or the night into different periods in order to regulate work or ritual. These inventions included oil lamps, water clocks, candle clocks, and hourglasses. The year was divided into twelve months, and farmers noted the seasons in order to plant and harvest their crops at the right time.

Gradually, mechanical clocks replaced the old clocks, sundials and hourglasses, and the measurement of time became more and more sophisticated and hi-tech. Now we have quartz watches with digital displays.



Incredible Red Blood Cells

Each drop of our blood contains 200 million red blood cells. Red blood cells develop in bone marrow, and circulate in the body for around 120 days. They have the important job of carrying oxygen around the body.

● *Sneha Rao*

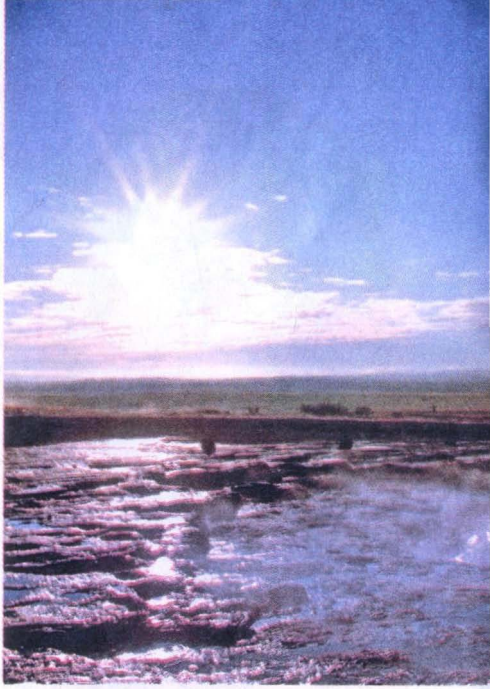
Why is fire hot?

Fire is a chemical reaction that occurs very quickly, and in the process, gives off heat and light. Three things are necessary for this reaction to occur- fuel, oxygen, and heat. Fuel– whether it is paper or wood- by itself will not catch fire. It is only when the fuel is heated, and becomes hot enough, that the oxygen in the air combines freely with it to burst into flames.

The reason, fire is hot is because it releases a lot of energy that has been stored in fuel. For example, energy from sunlight is stored in the wood that is used as fuel. When energy is released very quickly, heat and light are produced.

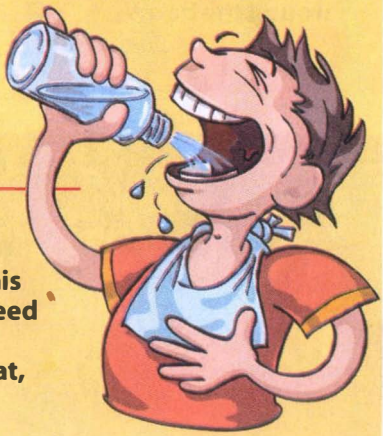
Why are geysers hot?

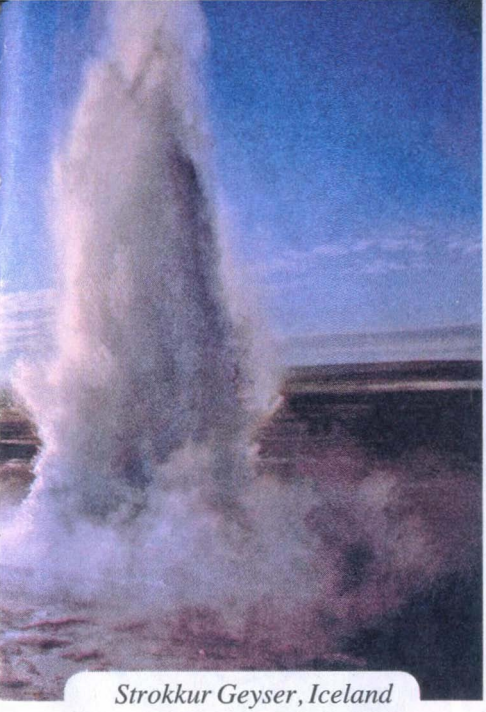
A geyser is a spring that shoots a column of hot water into the air. A geyser is formed when water seeps underground, flows through channels of underground rock, and then collects in underground reservoirs. The rocks deep underground are very hot, and gases from these hot rocks rise through cracks to reach the underground reservoir. As a result,



Sweat and Thirst

On a very hot day, you sweat a lot. When you sweat, your body loses water, and this makes you thirsty, and you need to drink more water. So, the hotter it is, the more you sweat, and the thirstier you get.





Strokkur Geyser, Iceland

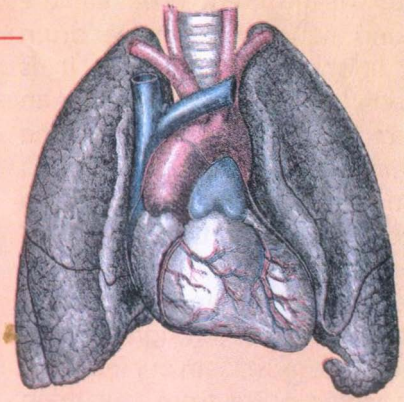
the water inside a pocket of a closed-off reservoir becomes extremely hot, and pressure begins to build up.

When the high pressure and heat causes some of the water to finally change to steam, the steam will push the hot water out of the reservoir, and a violent eruption of boiling water takes place. When the geyser stops erupting, the pressure starts to build again in the reservoir pocket, and the whole process starts over.

Take a Breath

A grownup's lungs can hold up to 5 litres of air. An average person breathes in around 11,000 litres of air every day. You breathe about 12 times every minute- and sometimes, this can go up to 75 times a minute.

● *Radha Nair*



Why do we tap our feet in time to music?

When you hear a catchy tune, your feet start tapping in time to the beat. One explanation given for this is that music has rhythm, and our bodies have rhythm too. After the music enters our ear, the sound then vibrates the ear drum in unison to the sound it is receiving. This then sends an electronic signal to the brain. The brain is not quite sure what to do with this information. It makes a decision to take the signal and apply it to a central nervous system. This then directs the electronic pulse through a nerve, and to the muscles in our feet. This electronic pulse from the brain sets our feet tapping!

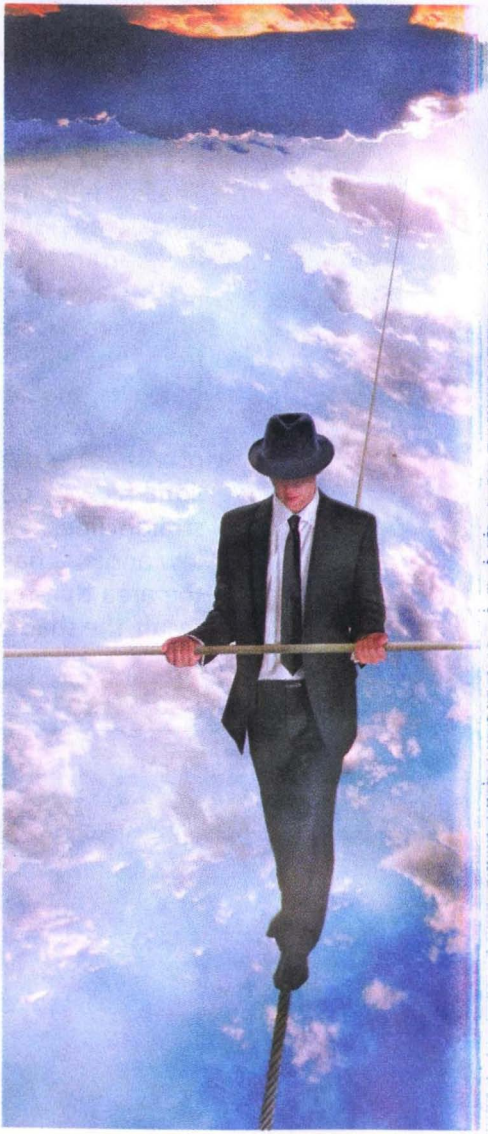
Wrinkled and Slimy

Our brains are wrinkled and slimy for very good reasons. Wrinkles allow more cells to be squashed inside the skull, and the sliminess comes from the fluid around the brain that cushions it when you move your head. The brain itself is made up of around 75 per cent water.

How does holding a pole help a person walking on a tightrope?

Tightrope walkers, make balancing seem easy while walking across a rope. Part of this is due to their years of practice, but part of it is also because they carry a long pole with them. Without a pole held horizontally, a person's centre of balance is located just beneath the ribcage, and there is a danger of toppling over. Carrying a long pole lowers our centre of balance, just as holding out our arms to the sides does. If the pole is long enough, a person's centre of balance can be lowered to their knees, ankles or even the tops of their feet.

A lower centre of balance makes it easier for anyone to balance while walking across even a narrow rope. For maximum balance, the pole should be long and heavy. The pole should also be bent downwards to further lower the centre of gravity, and increase the walker's stability.



Why is a shadow sometimes bigger than the object?

Two things are needed to make a shadow. The first is light. The second is something that blocks the light. Together, these two things make an area that is darker than what is around it. This area is called a shadow. People and objects make shadows when they block light from the Sun. You might have noticed however, that sometimes, a shadow is bigger than the actual object. This is because the size of a shadow depends on the angle at which light hits an object. Light always travels in straight lines. If it hits a solid opaque object at a low angle, it has to go around the object. So, the area that remains dark is larger- and as a result, the shadow is bigger.

Why do some beverages leave you feeling refreshed?

Drinks like tea, coffee, cocoa, chocolate, and colas all contain caffeine, an alkaloid that acts as a mild stimulant. Alkaloids are a group

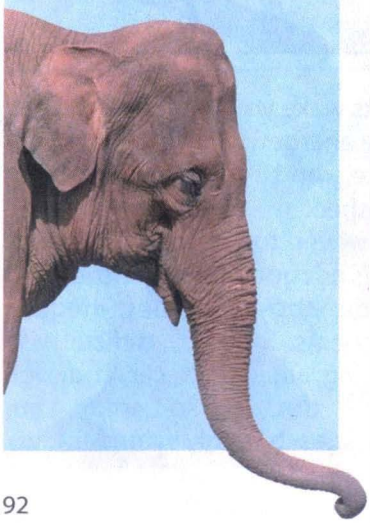
of naturally occurring chemical compounds that contain mostly basic nitrogen atoms.

The caffeine found in drinks relaxes your muscles, stimulates the heart and nervous system, quickens reflexes, increases mental sharpness, and reduces fatigue. As a result, these drinks wake you up, make you feel more energetic, fill you with confidence, and leave you feeling refreshed.

However, too much of coffee or cola is not good for you either. You can develop headaches, irregular heartbeats, nausea, difficulty in sleeping, anxiety attacks, and even muscle tremors. So, enjoy your beverages- but only in moderation.

An Amazing Nose

Elephants have the longest noses- their trunks. An elephant's trunk can be up to 2.5 metres long. It has more than 40,000 muscles in it, and is used not just to smell, but to lift up things, suck up water – and spray it too!



How much does the atmosphere weigh?

You may not realize it, but air has weight. Anything with mass has weight, and we know that air has mass, because we can feel it moving around when the wind blows. The air above us forms a blanket that we call the atmosphere. Composed of nitrogen, oxygen, carbon dioxide, and other gases, it surrounds the Earth, and extends almost a thousand kilometres above the Earth's surface. So there is a thousand-kilometre high column of air above our heads, and the column exerts a pressure known as the atmospheric pressure.

We don't get crushed by this pressure because our bodies have an internal pressure, which

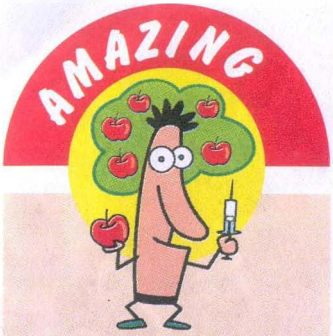
Smell and Taste

It's your sense of smell that helps you taste the flavours in your food better. That is why you feel everything is tasteless when you have a cold and your nose is blocked. You can't smell the food, so it doesn't taste good!

:ounters that of the atmos-
pheric pressure, and, in the
process, balances it out. This
nternal pressure is essential
:or our survival, because it has
been calculated that the air in
:he atmosphere weighs
around 5,700,000,000,000,000 tonnes! It has also been calculated that the atmosphere exerts a pressure of about 6.6 kgs per square inch at sea level. Hence, at sea level, we carry about 6.6 kilogrammes of weight on every inch of our body. Amazing, isn't it?

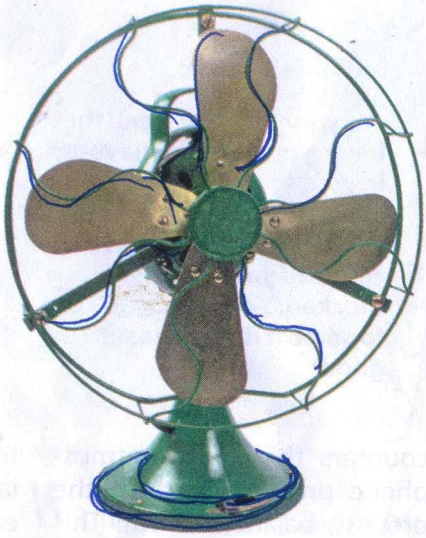
Solid or Liquid?

Glass looks like a solid, but its molecules are more similar to that of a liquid. It has the properties of both solids and liquids. Glass does not flow like a liquid, yet it never attains a crystalline structure that many people associate with a solid. So, it is called an amorphous solid.



Big Baby

The biggest baby on the planet is the baby Blue Whale. It drinks up to 500 litres of milk a day, weighs as much as 30 people put together, and is the size of two minivans!



Why are the wings of a fan slightly curved?

If you study the wings of a fan carefully, you will notice that they are not straight, but slightly curved. If a fan's wings, or blades as they are sometimes called, are straight, they will move the air as they revolve, but the volume of air that is moved will not be much. However, if the blade is slightly curved, a much larger volume of air will be circulated, so the cooling effect produced by the fan will be much greater. The flow of air will also increase as the speed of the fan's rotation increases.

NEXT ISSUE

100 MILESTONES IN CHEMISTRY

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GK CONTEST - 5 WINNERS

Winners of the GK Contest - 5, Photo Quiz - held in the October issue of Tell Me Why.

1. Aayushi Iyer
No: 850, Shakti Nagar, Jabalpur, Madhya Pradesh.

2. Mathews Manik Gomes,
Nagendranagar, Nadia, West Bengal.

3. Meenu Krishna R,
Midhulapuri, Odanavattom, Kottarakkara, Kerala.

4. Pranav Prakash,
Siswar Bazar, Phulparas, Madhubani, Bihar.

5. Ganesh Kamath,
No: 49, 1st floor, Canara Bank Colony, Nagarbhavi Road, Bangalore.

GK Contest - 5 Photo Quiz ANSWERS

1. Thomas Alva Edison 2. Joseph Swan
3. Sir Isaac Newton 4. C.V.Raman 5. Galileo

GK CONTEST - 7

GREAT LANDMARKS

Here's a contest in which our readers have to identify the five great landmarks.
All you need to do is send us an email with correct answers.

(PLEASE GIVE YOUR POSTAL ADDRESS ALSO IN THE EMAIL)

You are also welcome to send your answers by post.

Five winners will be awarded prizes.

In case there are more than five correct entries, the winners will be chosen by lot.

Last Date to receive entries: December 25th

Our email address:

childrensdivision@mmp.in

Please enter

TMW - GK CONTEST - 7

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SOLAR ROBOT

If you are sending your entry by post, superscribe this on your envelope.

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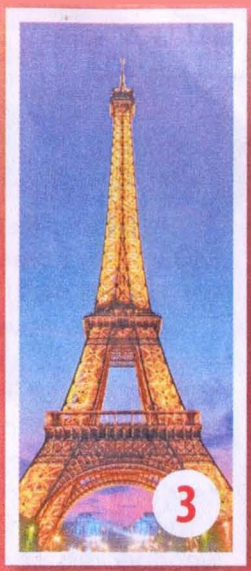
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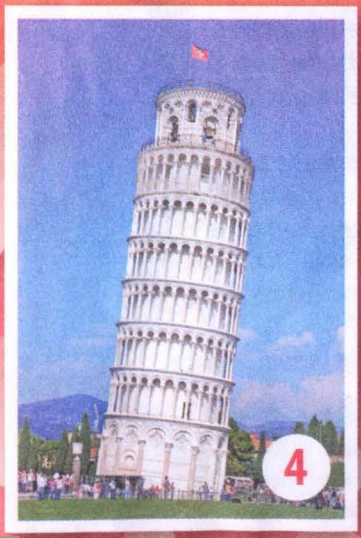
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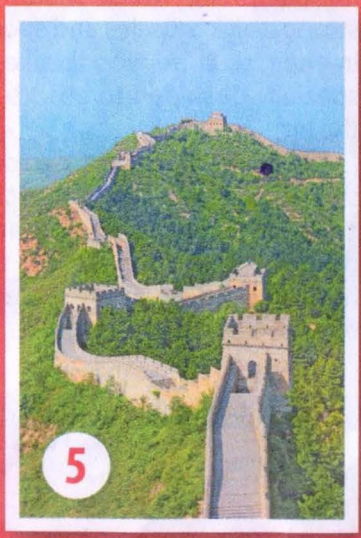
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I Wonder Why?

Send us your questions
E mail: tellmewhy@mmp.in

Question of the Month

Why don't woodpeckers get a headache?

Have you ever seen a woodpecker striking trees with its long beaks? Woodpeckers hit the trees up to 20 times per second. Yet they don't get a headache or any other head injury.

The reason for this is that woodpeckers are born with a helmet for the brain, which is formed of strong, thick muscles and sponge-like bones in their skull. A woodpecker's body too is specially designed to absorb the impact of the hit.

A millisecond before a woodpecker's bill strikes on a tree, dense muscles in the neck contract. Some of the force radiates down the neck muscles, and protect the skull from a huge impact. A compressible bone in the skull offers a cushion effect too.

● *Alwin George*

MANORAMA TELL ME WHY - THE CURIOUS WORLD OF SCIENCE

Editor: Ammu Mathew Editor-in-Charge: A.V. Harisanker*

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